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WA #: 060-RICO-02MV

Region 2 RAC2 Remedial Action Contract

Draft Work Plan, Volume 1

Pierson's Creek Site

Remedial Investigation/ Feasibility
Study

Newark, New Jersey

July 13, 2016

**CDM
Smith**

**REMEDIAL ACTION CONTRACT 2
FOR REMEDIAL RESPONSE, ENFORCEMENT OVERSIGHT,
CRITICAL REMOVAL ACTIVITIES AT SITES OF RELEASE OR
THREATENED RELEASE OF HAZARDOUS SUBSTANCES
IN EPA REGION 2**

**DRAFT WORK PLAN
VOLUME 1**

**PIERSON'S CREEK SITE
REMEDIAL INVESTIGATION/ FEASIBILITY STUDY
NEWARK, NEW JERSEY
Work Assignment No. 060-RICO-02MV**

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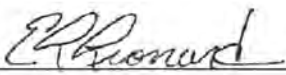
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Acronyms and Abbreviations

ARAR	Applicable or Relevant and Appropriate Requirement
bgs	below ground surface
CDM Smith	CDM Federal Programs Corporation
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CIP	Community Involvement Plan
CLP	contract laboratory program
CO	contracting officer
COPC	chemical of potential concern
CRQL	Contract Required Quantitation Limit
CSM	conceptual site model
DER	Data Evaluation Report
DESR	Data Evaluation Summary Report
DO	dissolved oxygen
DPM	deputy program manager
DQO	data quality objectives
DQM	data quality manager
EDD	electronic data deliverable
EPA	United States Environmental Protection Agency
EquIS	Environmental Quality Information Systems
ERAGS	Ecological Risk Assessment Guidance for Superfund
ESAT	Environmental Services Assistance Team
FAM	finance and administration manager
FS	feasibility study
GIS	Geographic Information System
GPR	Ground Penetrating Radar
GPS	Global Positioning System
HASP	Health and Safety Plan
HRS	Hazard Ranking System
mg/kg	milligram per kilogram
NCP	National Contingency Plan
NJDEP	New Jersey Department of Environmental Protection
NJDOT	New Jersey Department of Transportation
NPL	National Priority List
OSWER	Office of Solid Waste and Emergency Response
PAR	Pathway Analysis Report
PM	program manager
PO	project officer
PSO	Project Support Office
PVSC	Passaic valley sewage commission
QA	quality assurance
QAPP	quality assurance project plan
QAS	quality assurance specialist
QC	quality control
QMP	Quality Management Plan
RAC	Remedial Action Contract
RACMIS	remedial action contract management information system
RAGS	Risk Assessment Guidance for Superfund
RI	remedial investigation

ROD	record of decision
ROV	remotely operated vehicle
RPM	remedial project manager
RQAC	regional quality assurance coordinator
SLERA	Screening Level Ecological Risk Assessment
SM	site manager
SOW	statement of work
TRC	Technical Review Committee
WA	work assignment
WAM	work assignment manager
WWTP	wastewater treatment plant

Section 1

Introduction

CDM Federal Programs Corporation (CDM Smith) received Work Assignment (WA) 060-RICO-02MV under Remedial Action Contract (RAC) 2 to develop a remedial investigation/feasibility study (RI/FS) Work Plan for the United States Environmental Protection Agency (EPA), Region 2 for the Pierson's Creek site located in Newark, Essex County, New Jersey. The overall purpose of this WA is to develop a Work Plan and associated planning documents to evaluate the nature and extent of contamination in various media as identified in the EPA Statement of Work (SOW). Data collected during the field investigations will be used to prepare an RI Report, a Baseline Human Health Risk Assessment (HHRA), a Screening Level Ecological Risk Assessment (SLERA), and a Feasibility Study (FS).

The RI will focus on collecting adequate data to characterize the nature and extent of contamination in site media and to assess the risks to human health and the environment. The sampling approach is discussed in Section 3. A Quality Assurance Project Plan (QAPP) detailing sample and analytical requirements for the field investigation and a health and safety plan (HASP) will be submitted separately.

The FS will be completed in accordance with EPA guidance under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) "Interim Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA" (EPA 1988), or the most recent EPA FS guidance document. The FS will develop and screen a full range of remedial alternatives and provide a detailed analysis of selected alternatives.

1.1 Site Description and History Summary

Large amounts of data were previously collected at the Pierson's Creek site, primarily at the Troy Chemical Corporation (Troy Chemical) property, but also at nearby properties, during investigations conducted by various agencies during the period from 1977 to present. The existing data and information were collected, reviewed, evaluated, and summarized in a Technical Memorandum – Summary of Existing Information and Data Gap Evaluation (CDM Smith 2016). A brief description of the Pierson's Creek site and a brief site history are provided in the sections below.

1.1.1 Site Description

Pierson's Creek is an approximately 1.5-mile, man-made ditch located in a heavily industrialized section of Newark, New Jersey. Figure 1-1 shows the site location. The Creek has been used as an urban stormwater drainage structure for more than 100 years, and it continues to be a component of the City of Newark's stormwater management system. Historically (including at the time of mercury releases), Pierson's Creek surfaced from a 36-inch stormwater culvert just to the north of the Troy Chemical property and flowed in the concrete channel that bisects the Troy Chemical facility; an unnamed, intermittent tributary flowed along the eastern property boundary and joined Pierson's Creek just south of the facility. Due to a drainage improvement

project completed in 2007, the perennial portion of Pierson's Creek now begins just south of the Troy Chemical facility, where it receives stormwater runoff from a large culvert as well as the and east ditch on the Troy property.

Pierson's Creek flows from the Troy Chemical facility through a series of open channels and culverts, in a general south-southwesterly direction for approximately 1.5 miles to the Port Newark Channel portion of Newark Bay. Moving from Troy Chemical in the north to south, the creek flows through the former Red Star property (currently occupied by Continental Hardware), the vacant former Engelhard property (currently owned by 429 Delancy Associates LLC), Conrail's Oak Island rail yard, and private parking lots built on a former landfill within the Port of Newark. The creek flows through these properties for approximately 1 mile before being routed through culverts beneath Interstate 78, Newark International Airport, and New Jersey Turnpike.

Newark Bay is part of the New York-New Jersey Harbor Estuary, which also includes Upper New York Bay, Lower New York Bay, and Raritan Bay; the channels that connect the bays, including Arthur Kill/Pratt Creek, Kill Van Kull, and The Narrows; and the tidal portions of the Hackensack River, Passaic River, and other rivers. The surface water migration pathway for the Pierson's Creek site extends throughout the coastal tidal waters of Newark Bay, Arthur Kill, Kill Van Kull, Upper New York Bay, The Narrows, and into Lower New York Bay, in a series of arcs through the bays and lines through the channels.

Investigations by Troy Chemical, the New Jersey Department of Environmental Protection (NJDEP), and EPA have indicated significant increases in sediment mercury concentrations at and downstream of the facility compared to upstream sediment concentrations, as recently as 2010. In July 1979, EPA collected a sediment sample from Pierson's Creek just downstream of the mercury wastewater treatment system, and reported a mercury concentration of 22,400 milligrams per kilogram (mg/kg), compared to upstream concentrations of 140 and 191 mg/kg; EPA also reported mercury concentrations above background for samples collected downstream of the facility. The same report indicates a significant increase in water concentrations for benzene.

EPA conducted an investigation of Pierson's Creek in October 2012, which confirmed the observed release of mercury to the creek sediments. Mercury was detected in sediment samples collected throughout the accessible portions of the creek, and a site-attributable observed release is documented for a distance of approximately 0.25 mile downstream of the Troy Chemical facility. The affected area includes 0.15 mile of wetland frontage.

A number of metals which are hazardous substances under CERCLA, including arsenic, copper, lead, mercury, silver, and zinc, were detected at the site in the creek sediment and adjacent soils, at greatly elevated concentrations. Aroclor 1260 (Poly chlorinated biphenyl [PCB-1260]), a hazardous substance, has also been found at the site. Exposure to the various hazardous substances present at the site by direct contact, ingestion, or inhalation can cause a variety of adverse human health effects.

EPA placed the Pierson's Creek site on the National Priorities List (NPL) by publication in the Federal Register on September 16, 2014.

1.1.2 Site History

The Troy Chemical property is a 6.11-acre property having a history of chemical manufacturing uses dating back to the 1880s. Chemicals produced at the property have included ultramarine, aniline, and coal tar dyes as well as metallic soaps, paint dryers, mercuric oxide, and fungicides. The property was acquired by the present-day owner and operator, the Troy Chemical Corporation, Inc. (Troy Chemical), in 1980, although the company operated under the Troy Chemical Company name beginning in 1953.

The Troy Chemical facility discharged mercury-bearing wastewaters directly to Pierson's Creek without treatment until 1965, when the facility's mercury pretreatment system was installed at the edge of the Creek. Discharges of mercury-bearing wastewaters to Pierson's Creek continued from 1965 to 1976, even after a sulfide precipitation pretreatment system was installed. In 1976, the facility connected to the Passaic Valley Sewerage Commission (PVSC) sewer system, and began diverting wastewater from the mercury pretreatment system to the facility waste water treatment plant (WWTP), where wastewaters were treated by settling, removal of suspended solids and oil, and neutralization before subsequent discharge to the PVSC system. The additional levels of treatment at the WWTP did not remove all mercury from the process wastewater; the mercury contribution to PVSC as tested in 1979 was calculated to be approximately 327 pounds per day, and the facility discharged an average of more than 30,000 gallons per day of mercury-bearing wastewater to the PVSC sewer system for a 91-day period in 1986. The facility reported that it ceased the production of mercury-containing products that discharged to the sewer effluent as of February 1, 1987.

Other properties which may have discharged contaminants to Pierson's Creek include the former Prentiss Drug & Chemical Co. property, the former Albert Steel Drum Co. property, and the former Engelhard Corporation property.

1.2 RI/FS Objectives

The overall purpose of the RI/FS is to select a remedy to eliminate, reduce, or control risks to human health and the environment at the Pierson's Creek site. The objectives of this Work Plan are as follows:

- Characterize the nature and extent of contamination at the site
- Prepare the RI Report, FS, and human health and ecological risk assessments
- Provide adequate data to support the selection of an approach for site remediation and development of a Record of Decision (ROD)

1.3 Work Plan Content

This Work Plan contains three sections as described below.

- Section 1 – Introduction: Presents a brief description of the site, the Work Plan objectives, and format of the Work Plan.

- Section 2 – Work Plan Approach: Presents an overview of the technical approach to development of the Work Plan, the project schedule, project management plan, and quality assurance (QA) and document control.
- Section 3 – Task Plans: Presents the specific activities that will be performed and describes the reports and other deliverables that will be prepared and submitted to EPA.

For presentation purposes, figures and tables are presented at the end of this Work Plan.

Section 2

Work Plan Approach

2.1 Technical Approach to the RI/FS

CDM Smith has developed the technical approach described in this Work Plan in accordance with the EPA SOW and to ensure that all work and submittals meet the requirements of the following documents and policies:

- CERCLA, as amended
- Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, EPA/540/G-89/004, Office of Solid Waste and Emergency Response (OSWER) Directive 9355.3-01 (EPA 1988)
- Other applicable federal, state, and local requirements

CDM Smith has performed a preliminary review of existing data and documents provided by EPA including the Hazard Ranking System (HRS) Documentation Record and associated references, the Proposed Remedial Approach Report prepared for the Troy Chemical facility, dated September 2015, and other documents provided by EPA.

The NJDEP Technical Coordinator for the Troy Chemical facility and Pierson's Creek site and the NJDEP Chief Records Custodian were contacted and available records, reports, and data were obtained from NJDEP for the Pierson's Creek Site, the Troy Chemical facility, and nearby properties. The City of Newark Engineering Office was also contacted and provided documents related to the of Pierson's Creek and historical dredging that occurred in the Creek. The documents obtained from these file searches were evaluated and summarized in a Technical Memorandum – Summary of Existing Information and Data Gap Evaluation (CDM Smith 2016).

2.2 Project Organization

The proposed project organization is shown in Figure 2-1.

2.3 Quality Assurance

All work on this WA will be performed in accordance with the applicable corporate or programmatic Quality Management Plan (QMP). Evaluation of the existing data will be performed in accordance with EPA's policies for non-direct measurements. The quality assurance specialist (QAS) will maintain QA oversight for the duration of the WA. A QAS has reviewed this Work Plan for QA requirements.

The site manager (SM) is responsible for implementing appropriate quality control (QC) measures on this WA. Such QC responsibilities include:

- Implementing the QC requirements referenced or defined in this Work Plan

- Adhering to accordance with the applicable corporate or programmatic Management Information System document control system
- Organizing and maintaining WA files
- Conducting planning meetings, as needed, in accordance with the QMP

Technical and QA review requirements as stated in the QMP will be followed on this WA.

Document control aspects of the program pertain to controlling and filing documents. A filing system that conforms to EPA's requirements to ensure that the documents are properly stored and filed must be developed and followed. This system will be implemented to control and file all documents associated with this WA. The system includes document receipt control procedures, a file review, an inspection system, and file security measures.

2.4 Project Schedule

A project schedule is included as Table 2-1.

2.5 General Requirements

General requirements include those relating to sustainable (or green) remediation, project data management, and record-keeping, as described in the following sections.

2.5.1 Green Remediation

Green remediation is the practice of considering all environmental effects of the implementation of a remedy and incorporating options to maximize the net environmental benefit of cleanup actions. In accordance with EPA's strategic plan for compliance and environmental stewardship, EPA strives for cleanup programs that use natural resources and energy efficiently, reduce negative impacts on the environment, minimize or eliminate pollution at its source, and reduce waste to the maximum extent possible. EPA's Region 2 Superfund program supports the adoption of "green site assessment and remediation," which is defined as the practice of considering all environmental impacts of studies, selection, and implementation of a given remedy, and incorporating strategies to maximize the net environmental benefit of cleanup actions (see <http://www.clu-in.org/greenremediation>). In addition, EPA established a "Clean & Green" policy to enhance the environmental benefits of Superfund cleanups by promoting technologies and practices that are sustainable.

To the extent practicable, green remediation strategies will be implemented during the performance activities described in this work plan to maximize sustainability, reduce energy usage, promote carbon neutrality, promote industrial materials reuse and recycling, and protect and preserve land resources. The ASTM Standard Guide for Greener Cleanups (ASTM 2016) will be reviewed and implemented. Green remediation related activities will be reported to EPA in monthly progress reports or as requested by EPA.

2.5.2 Laboratory Accreditation/Certification Requirements

All environmental and analytical subcontract laboratories to be used for execution of this RI/FS will be currently certified or accredited for the matrices and analyses to be conducted. The

certification or accreditation shall be granted by the National Environmental Laboratory Accreditation Program (NELAP), the American Association of Laboratory Accreditation (AALA), or the EPA Contract Laboratory Program (CLP). Certification or accreditation must be valid at the time of the subcontract award and maintained throughout the duration of the work assignment.

2.5.3 Project Data Management and Electronic Data Deliverable Requirements

The goals of project data management are to store and manage the data generated during the project so they are ready and available for analysis and reporting, and to prepare the project electronic data deliverable (EDD) for submittal to EPA. Examples of the data to be managed during this project include logbooks, maps, field data sheets, location data (survey and global positioning system [GPS] data), well construction data, water level data, field results, and sample analytical results. Data on paper will be stored and managed using a project filing system. Data in electronic format will be stored and managed using Environmental Quality Information System (EQuIS™) environmental database software from EarthSoft (version 5.5 or current version). The EQuIS™ database provides a standard format for data storage and reporting. It will also support the analysis and presentation of data using gINT, Microsoft Excel, ArcMAP geographic information system (GIS) software, AutoCAD, Surfer, and other applications as needed. The data stored in EQuIS™ will ultimately be used to generate the required EPA Region 2 EDD.

The key data management roles on the project include the data provider, the SM, the data quality manager (DQM), project staff, the EQuIS™ database administrator, and the analytical services coordinator (ASC). The SM and DQM work together to troubleshoot problems with analytical EDDs, ensure that data management is conducted in a timely and efficient manner and that proper QA/QC procedures are followed. Data will be uploaded to the database from Excel EDD files prepared by project staff to ensure that the data are complete and accurate. The EQuIS™ database administrator is responsible for verifying that Excel EDDs comply with EPA Region 2 requirements, loading the EDDs into EQuIS™, and creating reports. The ASC logs analytical EDDs received from laboratories into the EDD tracking system, works with laboratories, and assists in arranging data validation.

At the conclusion of the project, a project EDD will be submitted to EPA. The EDD will include field sampling and laboratory analytical results, geologic data, and well location data in accordance with Region 2's policies, guidelines, and formats. The EDD will be prepared in accordance with the EPA Region 2 Electronic Data Deliverable Comprehensive Specification Manual 3.0 (EPA 2015a) for the systematic implementation of EDD requirements, data preparation, and identification of data fields required for data submissions. Other Region 2 EDD guidance and requirements documents that will be followed include the Electronic Data Deliverable Valid Values Reference Manual and tables (EPA 2015b), the Basic Manual for Historic Electronic Data (EPA 2015c), "Standalone EQuIS Data Processor User Guide," the "CLP EDD Conversion Tool Manual" and EDD templates will be followed and utilized.

2.5.4 Record-Keeping Requirements

All technical and financial records for this WA will be maintained in accordance with the requirements of the SOW and the technical direction of the EPA remedial project manager (RPM). These technical and financial records will be in sufficient detail to support decisions made during this RI/FS. At the completion of the RI/FS, three bound copies of the official record of the work

will be submitted to EPA. One copy of the major deliverables in electronic format will be submitted to the EPA RPM and one copy will be submitted to the EPA records manager.

Section 3

Task Plans

The tasks identified in this section correspond to EPA's SOW for the site, dated August 21, 2015. CDM Smith previously submitted a Work Plan (CDM Smith 2015) for a subset of planning tasks, which is noted in the below subsections. The tasks for the RI/FS presented below correspond to the applicable tasks presented in the Interim Final Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (EPA 1988). In addition, EPA's SOW includes a task for project closeout. The task presentation order and numbering sequence correspond to the work breakdown structure provided in EPA's SOW.

3.1 Task 1 – Project Planning and Support

The project planning task generally involves several subtasks that must be performed in order to develop the plans and the corresponding schedule necessary to execute the RI/FS. These subtasks include project administration, conducting a site visit, performing a review and detailed analysis of existing data, attending technical meetings with EPA and other support agencies, preparing this RI/FS work plan, preparing the QAPP and HASP, procuring and managing subcontractors, and preparation the Pathway Analysis Report (PAR).

3.1.1 Project Administration

This activity was scoped under the previously submitted work plan.

3.1.2 Attend Scoping Meeting

This activity was scoped under the previously submitted work plan.

3.1.3 Conduct Site Visit

This activity was scoped under the previously submitted work plan.

3.1.4 Develop Draft Work Plan and Associated Cost Estimate

This activity was scoped under the previously submitted work plan.

3.1.5 Negotiate and Revise Draft Work Plan/Budget

This activity was scoped under the previously submitted work plan.

3.1.6 Evaluate Existing Data and Documents

This activity was scoped under the previously submitted work plan. However, additional information from City of Newark, Port Authority of NY and NJ, Conrail and New Jersey Department of Transportation (NJDOT) still needs to be obtained and reviewed to support development of the RI/FS Work Plan for those sections of Pierson's Creek that are culverted beneath Conrail's Oak Island rail yard, Interstate 78, Newark International Airport, and New Jersey Turnpike.

3.1.7 Quality Assurance Project Plan

A site-specific Quality Assurance Project Plan (QAPP) will be prepared covering activities that will be performed as part of the RI/FS. The QAPP will be prepared in accordance with EPA QA/R-5, “EPA Requirements for Quality Assurance Project Plans” (EPA 2006); EPA 505-B-04-900A, “Uniform Federal Policy for Quality Assurance Project Plans” (EPA 2005a) and optimized 2012 worksheets; and current EPA Region 2 QAPP guidance and procedures.

3.1.8 Health and Safety Plan

A HASP will be prepared specifying the health and safety requirements for all field activities to be performed during the RI. The HASP will be in accordance with Subpart B, Section 150, “Worker health and safety” of the National Contingency Plan (NCP) at 40 Code of Federal Regulations (CFR) 300.150, and with 29 CFR 1910.120 (1)(1) and (1)(2). The HASP will be subject to revision, as necessary, based on new information that is discovered during the field investigation.

3.1.9 Non-RAS Analysis

At the direction of EPA, an EPA-approved laboratory QA program will be developed that provides oversight of in-house and subcontracted laboratories through periodic performance evaluation sample analyses and/or on-site audits of operations, and prescribes a system of corrective actions to be implemented in cases where the laboratory’s performance does not meet the standards of this program. The minimum requirements are specified below.

- Prepare Laboratory Services Requests (including statements of work) for all non-routine analytical service (RAS) parameters. The Laboratory Services Requests will include the elements listed below.
 - digestion/analytical methods
 - data deliverable requirements
 - QC requirements
 - estimated number of samples
 - method restrictions and penalties for non-compliance
 - turnaround times
- Develop QC criteria for each parameter of the approved site-specific QAPP that will be incorporated into the Laboratory Service Request.
- Comply with all applicable and appropriate requirements in the acquisition and management of subcontracts for analytical services, including the requirements, terms, and conditions of this contract and the subcontractor’s corporate standard operating procedures.
- At the request of the EPA Remedial Project Manager (RPM), submit the Laboratory Services Requests for EPA review prior to solicitation of an analytical services subcontract.

3.1.10 Meetings

Eight project meetings with EPA will be required during the course of the work assignment. All eight of these meeting will be held in New York. Meeting minutes will be prepared which list the attendees and summarize the discussions in each meeting.

3.1.11 Subcontractor Procurement

The subcontractors necessary to perform the requirements of the RI/FS will be identified, solicited, and subcontracts awarded. It is anticipated that Subcontractors needed to support the RI/FS will include laboratory services, drilling services, vibra-core sediment sampling services, investigation-derived waste (IDW) characterization and disposal services, and surveying services. Subcontractors to perform remotely operated vehicle (ROV) or robotic sampling, subsurface geophysics, and aerial thermal imaging may also be required.

3.1.12 Perform Subcontract Management

The necessary processes and procedures will be implemented to manage and oversee the subcontracts, monitor subcontractor progress, issue any subcontract modifications, and maintain systems and records to ensure that the work proceeds in accordance with the subcontracts.

3.1.13 Pathway Analysis Report

A Pathway Analysis Report will be prepared and submitted in accordance with the “Risk Assessment Guidance for Superfund (RAGS): Part D” (EPA 2001). The submittal will include the conceptual site model (CSM), the RAGS Part D Standard Tables 1 through 4 series, and a description of the risk characterization and how the draft HHRA will be prepared. The Pathway Analysis submittal will contain all of the information necessary for a reviewer to understand how the risks at the Site will be addressed, including the statistical treatment of the data, the methods for selection of the chemicals of potential concern (COPCs), the exposure pathways, receptors and parameters to be used, and the current toxicological values. The Pathway Analysis tables will be prepared after all analytical data are collected, in accordance with the requirements of RAGS, Part D Tables 1 through 4. If modeling is recommended, a description of the model and an explanation of the inputs and assumptions will be included in the submittal so their appropriateness can be determined. A conference call will be scheduled with the EPA RPM and risk assessor to discuss the Pathway Analysis submittal. The results of the Pathway Analysis submittal will be included in the draft HHRA described under Subtask 3.7.1.

3.2 Task 2 – Community Relations

As directed by EPA technical support will be provided during the performance of the following community involvement activities throughout the RI/FS in accordance with the EPA Superfund Community Involvement Handbook (EPA 2005b).

3.2.1 Community Interviews

Relevant background documents will be reviewed and technical support will be provided to prepare draft interview questions for the community interviews. Final interview questions will be submitted reflecting EPA’s comments on the draft questions.

3.2.2 Community Involvement Plan

A draft community involvement plan (CIP) will be prepared that presents an overview of the community's concerns. The CRP will include:

- Site background information including location, description, and history
- Community overview including a community profile, concerns, and involvement
- Community involvement objectives and planned activities, with a schedule for performance of activities
- Mailing list of contacts and interested parties
- Names and addresses of information repositories and public meeting facility locations
- List of acronyms
- Glossary

A final CRP will be submitted that reflects EPA's comments on the draft CIP.

3.2.3 Public Meeting Support

EPA will require support for the following activities to at public meetings and availability session.

- Make reservations for a meeting space, in accordance with EPA's direction
- Attend public meetings and availability session, and prepare draft and final meeting summaries
- Reserve a court reporter for each of the two public meetings
- Provide copies of meeting transcripts.
- Provide and maintain a sign-in sheet for each public meeting and use the names on the sign-in sheet to update the site mailing list

Support will also be needed to develop draft visual aids (i.e., slides and handouts) as instructed by EPA and develop final visual aids incorporating all EPA comments.

3.2.4 Fact Sheet Preparation

A draft fact sheet will be researched, written, edited, designed, and laid out, in accordance with the approved community relations plan for this site, as directed by EPA. The draft fact sheet will be provided to EPA for review. A final fact sheet will be prepared incorporating all EPA review comments. Photocopies of the final fact sheet will be provided and mailing labels will be attached to the copies before delivering them to EPA, who will be responsible for mailing.

3.2.5 Proposed Plan Support

Per the EPA SOW, this subtask is not applicable.

3.2.6 Public Notices

Newspaper announcements/public notices will be prepared for publication in the most widely-read local newspapers, in support of the public meetings and availability session. The newspaper advertisements will be published in the most widely-read local newspapers, with each ad placed in a large area-wide newspaper and a small local newspaper.

3.2.7 Information Repositories

Per the EPA SOW, this subtask is not applicable.

3.2.8 Site Mailing List

A mailing list for community relations activities at this site will be prepared and updated. An electronic copy of the mailing list and mailing labels for each mailing will be provided to EPA. EPA will do the actual mailing of any information to the community.

3.2.9 Responsiveness Summary Support

Administrative and technical support for the site Responsiveness Summary will be provided. A draft Responsiveness Summary will be prepared compiling and summarizing comments received during the public comment period on the Proposed Plan. Technical reviews and draft responses for selected technical comments will be prepared for EPA's review and use in preparing the formal responses.

3.3 Task 3 – Field Investigation

3.3.1 Site Reconnaissance

Site Reconnaissance will be conducted to identify and locate existing monitoring wells, storm sewers in the parking lot areas, seeps and other point source and non-point source discharges to the creek, culverts and other significant drainage infrastructure, potential access locations to buried portions of the creek, background locations and sampling locations. The locations of relevant features to be surveyed will be marked with stakes, paint or flagging, as appropriate.

A topographic and bathymetric survey will be conducted by a licensed surveyor covering property boundaries, utility rights-of-way, channel dimensions of Pierson's Creek and its tributaries, locations and elevations of culverts, locations of potential manholes or other access points, existing monitoring wells and marked locations and site topographic information.

If the site reconnaissance activities listed above do not adequately provide the information necessary to conduct a remedial investigation to adequately characterize the nature and extent of contamination at the site, ROV/robots, subsurface geophysics (ground penetrating radar (GPR) and/or magnetometer), aerial thermal imagery, and dye testing may be required.

3.3.2 Mobilization and Demobilization

This task includes mobilizing personnel, equipment, and materials necessary to perform the field investigation. Mobilization activities will include a field planning meeting, an initial health and safety debriefing for project team members, siting and electrical hookup of a trailer, and purchase/rental and mobilization of equipment and supplies.

Demobilization activities will include removal of all equipment and facilities brought to the site.

Site Access Support

Access to public areas (roads, sidewalks, etc.) and private property will be needed to execute the field investigation. EPA will be responsible for obtaining site access. Access support will be provided to EPA.

A list of owners of properties (public and private) to be accessed during the field activities will be provided to EPA. The list will include contact names, mailing addresses and telephone numbers of the property owners. Once EPA has established that access has been granted, sampling activities can begin. Coordination with property owners, local officials, and appropriate City of Newark agencies (for work in public areas) will be provided to support sampling activities.

Cultural Resources Survey

In accordance with the National Historical Preservation Act, a cultural resources subcontractor will be procured to conduct a Phase IA survey to determine the presence or absence of cultural resources that may be impacted by the implementation of the RI or Remedial Action (RA).

3.3.3 Hydrogeological Assessment

In order to investigate contamination in site groundwater, 15 existing monitoring wells will be located and evaluated, and if suitable, recommended for use in the RI/FS. Twenty-four additional monitoring wells will also be installed, with the support of a subcontract drilling firm. Oversight and direction of the subcontract drilling firm will occur during well drilling, installation, development, and surveying of monitoring wells. Locations will be selected for the monitoring wells following the completion of site reconnaissance described in **Section 3.3.1**. Preliminary proposed locations are shown on **Figures 3-1 to 3-3**. Final locations will be confirmed with EPA prior to installation.

Monitoring Well Evaluation

Existing monitoring wells will be evaluated to determine their suitability, both conceptually and technically, for sampling and/or for water level measurements required to characterize groundwater for the RI. Existing wells will be visually inspected to determine if the surface completion is intact. The wells will be sounded with a weighted tape and well depths will be compared to well installation records to determine if sediment has entered the well. The wells will also be redeveloped as described below to ensure a good hydraulic connection with the aquifer. Existing wells that will be used in the RI will be surveyed.

Monitoring Well Installation

Monitoring wells will be installed to straddle the water table at an expected depth of 2 to 6 feet below ground surface (bgs). The proposed drilling method is hollow-stem auger (HSA) drilling with 6.25-inch inside diameter (I.D.) augers to allow installation of a 4-inch I.D. Schedule 40 polyvinyl chloride (PVC) monitoring well. Wells are expected to be screened from 5 to 10 feet bgs, but will be adjusted based on the depth to water at each well location.

Split-spoon samples will be collected continuously from the surface to total depth in each well. The split-spoon samples will be lithologically logged by the onsite geologist and scanned with a PID and a mercury vapor detector and sampled as described in **Section 3.3.5.5**. Upon reaching

the terminal depth, the annulus around the well screen will be backfilled with sand, which will extend 2 feet above the well screen, followed by a 4-foot bentonite chip seal, which will be allowed to hydrate before the borehole is grouted to the surface. Wells will be completed with heavy duty 6-inch diameter flush-mount curb boxes and fitted with lockable compression plugs. Well drilling and construction details will be specified in the QAPP.

Details on the proposed monitoring well installation locations are provided in **Section 3.3.5.5**.

Monitoring Well Development

Monitoring well development will be performed to remove silt and clay from the well and sand pack and to provide a good hydraulic connection between the well and the aquifer materials. Turbidity, pH, temperature, conductivity, and dissolved oxygen (DO) will be monitored during development. Development will continue until all parameters have stabilized (within 10 percent for successive measurements) and the water is clear. Well development procedures will be detailed in the QAPP.

Synoptic Water Level Measurements

Four rounds of synoptic water levels will be collected to better define groundwater flow and groundwater-surface water interactions in the vicinity of the site. Synoptic water level measurements will be collected with each round of groundwater sampling and concurrent with both the dry weather and wet weather surface water sampling. Measurements from staff gauges will be collected during the synoptic water level measurement.

Surface Water Reconnaissance/Evaluation

Concurrent with the Site Reconnaissance described in Section 3.3.1, the creek and its tributaries will be inspected for evidence of groundwater seeps and site runoff. If locations are identified they will be and included in the site survey.

Staff gauges will be installed in the creek adjacent to the seven monitoring well transects and will be topographically surveyed. As discussed above, readings from the staff gauges will be collected during the rounds of synoptic water levels. If the staff gauges cannot be installed effectively, installation of stilling wells will be evaluated.

If the fluctuation in surface water levels from storm events happens on a time scale which cannot be effectively captured by manual measurements, stilling wells with data recording pressure transducers will be used to collect stream elevation measurements. The stilling well and the cross section of the creek channel will be surveyed by the survey subcontractor.

Groundwater and Site Runoff/Surface Water Interaction

In areas where the stream is potentially gaining flow from groundwater or surface runoff, potentiomanometers will be installed in the creek or tributaries used to measure the hydraulic-head difference between groundwater and surface water.

3.3.4 Soil Boring Drilling and Testing

Monitoring well installation is discussed in **Section 3.3.3**. Soil and sediment sampling is discussed in **Section 3.3.5**.

3.3.5 Environmental Sampling

This subsection summarizes the various field investigations that will be performed to characterize the nature and extent of contamination at the site. These include:

- Sediment investigation
- Surface water investigation
- Soil boring investigation
- Groundwater investigation

Each media is divided into five sections of the site due to the differing physical characteristics and access limitations of each section. The areas are identified on **Figure 3-1**. The sections are the upper creek section (**Figure 3-2**), middle creek section (**Figure 3-3**), the lower creek section (**Figure 3-4**), the culverted section (**Figure 3-1**) and Port Newark Channel (**Figure 3-5**). Sample numbers and locations are assumed, but with the consent of EPA may need to be adjusted following site reconnaissance.

3.3.5.1 Background Locations

During Site Reconnaissance (**Section 3.3.1**) appropriate locations will be identified for background sampling of soil and sediment. Three locations will be identified for soil, three for creek sediment and three for Port Newark sediments. These background sampling locations will be located in the vicinity of the site and will be un-impacted by site related contaminants, to the extent possible.

Background locations will not be identified for surface water and groundwater because there is no upstream area of the creek to sample.

3.3.5.2 Sediment Investigation

The purpose of sediment sampling is to delineate the horizontal and vertical extent of contamination at the site. Sediment cores will be collected using DPT sampling techniques. Sample cores in the upper creek section, middle creek section and lower creek section will be collected to the contact with native soil, which is assumed to be 5 feet bgs. Cores will be scanned with a mercury vapor detector and a PID and described for lithology. Sample intervals may need to be adjusted based in depth to native sediment. Changes in sample intervals will be reviewed and approved by EPA. Sample analyses are presented in **Table 3-1**. Sampling and analytical methods will be detailed in the QAPP.

Upper Creek Section (Figure 3-2)

Five analytical samples will be collected from each boring, at depths of 0 to 0.5 feet, 0.5 to 1.5 feet, 1.5 to 3 feet, 3 to 5 feet and the top 6 inches of native sediment (if it can be identified).

- Sediment cores will be collected approximately every 200 feet within the tributary to Pierson' Creek, for a total of six locations. The width of the channel will be measured and the boring will be collected at the location within the baseflow channel which has the greatest accumulation of sediment.

- Sediment cores will be collected every 100 feet in the Pierson's Creek channel, for a total of four locations.
- Two transects of sediment cores will be collected within the upper creek section (Figure 3-2). Two sediment cores will be collected within the channel and one will be taken from each creek slope, for a total of four borings at each transect location (8 borings). Borings will be located in areas with the greatest deposition of sediments.

Middle Creek Section (Figure 3-3)

Five analytical samples will be collected from each boring, at depths of 0 to 0.5 feet, 0.5 to 1.5 feet, 1.5 to 3 feet, 3 to 5 feet and the top 6 inches of native sediment (if it can be identified).

- Sediment cores will be collected approximately every 200 feet within the two tributaries to Pierson' Creek in this area, for a total of eight locations. The width of the channel will be measured and the boring will be collected at the location within the baseflow channel which has the greatest accumulation of sediment.
- Sediment cores will be collected every 100 feet in the Pierson's Creek channel, for a total of nine locations.
- Two additional sediment cores will be collected where the tributaries enter Pierson's Creek.
- Three transects of sediment cores will be collected within the middle creek section (**Figure 3-3**). Two sediment cores will be collected within the channel and one will be taken from each creek slope, for a total of 4 boring locations at each of the three transections (12 borings). Borings will be located in areas with the greatest deposition of sediments.

Lower Creek Section (Figure 3-4)

Five analytical samples will be collected from each boring, at depths of 0 to 0.5 feet, 0.5 to 1.5 feet, 1.5 to 3 feet, 3 to 5 feet and the top 6 inches of native sediment (if it can be identified). Samples collected from culverted areas will be grab samples from the top 0.5 feet of sediment, if available.

- Sediment cores will be collected approximately every 200 feet within the three tributaries to Pierson' Creek, for a total of seven locations. The width of the channel will be measured and the boring will be collected at the location within the baseflow channel which has the greatest accumulation of sediment.
- Large portions of Pierson's Creek are below ground in the lower creek section. Sediment samples will be collected every 100 feet in the Pierson's Creek channel where access is assumed, for a total of 10 locations.
- Three additional sediment cores will be collected at a where the tributaries enter Pierson's Creek.
- Three sediment grab samples will be collected from the culverted areas of this section, one from reach under the rail yard and two from below the parking lot.

- Additional sampling methods, including sampling from manholes or using ROVs may be necessary to collect samples from the underground portions of Pierson's creek

Culverted Section (Figure 3-1)

Samples collected from culverted areas will be grab samples from the top 0.5 feet of sediment, if available.

- Five grab samples will be collected from within the culverted section, approximately every 500 feet.
- Additional sampling methods, including sampling from manholes or using ROVs may be necessary to collect samples from the underground portions of Pierson's creek.

Port Newark Channel (Figure 3-5)

Twelve sediment cores will be collected from within Port Newark Channel using a vibracore coring device. Cores will be scanned with a mercury vapor detector and a PID and described for lithology. Seven analytical samples will be collected from each core, at depths of 0 to 0.5 feet, 0.5 to 1.5 feet, 1.5 to 3.0 feet, 3.0 to 5.0 feet, plus 5.0 to 7.0 feet, 7 to 10 feet, and the top 6 inches of native sediment (if it can be identified). Sample intervals may need to be adjusted based in depth to native sediment. Changes in sample intervals will be reviewed and approved by EPA. Sample analyses are presented in **Table 3-1**. Sampling and analytical methods will be detailed in the QAPP.

3.3.5.3 Surface Water Investigation

The purpose of surface water sampling is to characterize the nature and extent of contamination within Pierson's Creek and the potential contributions of its tributaries. Two rounds of surface water samples will be collected, one under dry conditions and one following an average storm. The purpose of dry weather sampling is to assess baseline transport conditions. The purpose of wet weather sampling is to assess contaminant transport under conditions when contaminants will be mobilized from the creek sediments and from areas within the drainage basin.

Dry conditions are assumed to be at least 48 hours since precipitation. Wet conditions are assumed to be at least a 0.5 inches of precipitation in a 4 hour window following a 48 hour dry period. Mobilization protocol for the dry and wet weather sampling will be detailed in the QAPP. Sample analyses are presented in **Table 3-1**.

Upper Creek Section (Figure 3-2)

- Two surface water samples will be collected from the tributary in this section. Samples will be co-located with sediment core locations as shown on **Figure 3-2**.
- Two surface water samples will be collected from Pierson's Creek and co-located with the sediment transect locations as shown on **Figure 3-2**.

Middle Creek Section (Figure 3-3)

- Three surface water samples will be collected from Pierson's Creek and co-located with the sediment core locations.

- One surface water sample will be collected from Pierson's Creek where the creek emerges from passing under Delancy Street at the top of the section and one will be collected at the bottom of the middle creek section before the Pierson's Creek passes under Conrail Access Road. These samples are co-located with sediment cores.
- Two additional surface water samples will be collected where the tributaries enter Pierson's Creek. These samples are co-located with sediment cores.

Lower Creek Section (Figure 3-4)

- In the lower creek section, four surface water samples will be collected from Pierson's Creek where the creek enters and leaves culverts and co-located with the sediment core locations.
- Three additional surface water samples will be collected where the tributaries enter Pierson's Creek and will be co-located with sediment core locations.
- Three surface water grab samples will be collected from the culverted areas of this section, one from reach under the rail yard and two from below the parking lot.
- Additional sampling methods, including sampling from manholes or using ROVs may be necessary to collect samples from the underground portions of Pierson's creek.

Culverted Section (Figure 3-1)

- Five grab samples will be collected from within the culverted section, approximately every 500 feet.
- Additional sampling methods, including sampling from manholes or using ROVs may be necessary to collect samples from the underground portions of Pierson's creek.

Port Newark Channel (Figure 3-5)

- A surface water sample will be collected from the outfall of Pierson's Creek in to Port Newark.

3.3.5.4 Soil Investigation

The purpose of soil sampling is to characterize the nature and extent of contaminated soil within the Pierson's Creek watershed which can be eroded into the creek and to evaluate whether the soils adjacent to the creek have been impacted by creek overflow. One round of soil samples will be collected. Five analytical samples will be collected from each boring, at depths of 0 to 0.5 feet, 0.5 to 1.5 feet, 1.5 to 3 feet, 3 to 5 feet and the top 6 inches of native soil (if it can be identified). Procedures for soil sampling will be detailed in the QAPP. Sample analysis is presented in **Table 3-1**.

Upper Creek Section (Figure 3-2)

- Three soil borings will be collected from adjacent to the tributary in this section. Sample locations are shown on **Figure 3-2**.

Middle Creek Section (Figure 3-3)

- Fifteen soil borings will be collected from the area adjacent to Pierson's Creek and the area between Pierson's Creek and the tributary to the east. Sample locations are shown on **Figure 3-3**.

Lower Creek Section (Figure 3-3)

- No soil samples are currently planned for this section of the site. However, if areas of potential flooding or overflow areas or potentially erodible contaminated soils are identified during site reconnaissance additional sampling locations may be required.

Port Newark Channel (Figure 3-4)

- No soil samples are planned for this section of the site.

3.3.5.5 Groundwater Investigation

The purpose of the groundwater investigation is to delineate the impact of groundwater on the nature and extent of contamination within the creek and evaluate the groundwater-surface water interactions. Well installation and groundwater-surface water interactions are discussed in **Section 3.3.3**. Two rounds of groundwater samples will be collected from 15 existing and 22 newly installed wells. Sample analysis is presented in **Table 3-1**. Wells will be sampled using the low-flow sampling methods. Sampling methods will be detailed in the QAPP.

Upper Creek Section (Figure 3-2)

- Eleven historical wells are located in this section of the site.
- Eight new wells will be installed in this section of the site. The wells are located in a transect perpendicular to Pierson's Creek where the sediment transects are located.

Middle Creek Section (Figure 3-3)

- Four historical wells are located in this section of the site.
- Twelve new wells will be installed in this section of the site. The wells are located in a transect perpendicular to Pierson's Creek where the sediment transects are located.

Lower Creek Section (Figure 3-4)

- Four new wells will be installed in this section of the site.

Port Newark Channel (Figure 3-5)

- No groundwater samples are planned for this section of the site.

Existing wells will be identified during site reconnaissance and the number of existing wells to be sampled is subject to change and will be approved by EPA.

3.3.6 Ecological Characterization

An Ecological Characterization will be performed that will include a qualitative assessment of general Site habitats. Information regarding the presence of threatened and endangered species, and ecologically sensitive environments that may exist at or in the vicinity of the Site will be requested from the appropriate agencies.

The field effort will identify Site habitats both within and in the vicinity of the Site that may potentially be affected by Site contaminants. Site conditions and conditions of the adjacent area will be visually inspected. Representative photographs to document field activities will be taken. Observations of general site habitats, wildlife utilization, and contaminant exposure pathways will be made and include the types of information summarized below.

- Vegetation cover types on and in areas immediately adjacent to the Site
- Dominant vegetation species and general visual observations of abundance/diversity
- Topographic features (e.g., drainages, sinkholes)
- Location of surface waters and their general aquatic habitat characteristics (e.g., approximate size, flow and direction, bottom substrate, and plant coverage)
- Observations of wildlife use, including (to the extent practicable) species identification and evidence of usage
- Indications of environmental stress that may be related to site contaminants

The results of this characterization will be used in the SLERA and in the ecological characterization section of the RI report.

3.3.7 Geotechnical Survey

As directed by EPA, this subtask is not applicable.

3.3.8 Investigation Derived Waste Characterization and Disposal

A subcontractor will be procured and will be responsible for the removal and proper disposal of all IDW, including drilling cuttings, waste soils, liquids, solids, and personal protective equipment. Representative waste samples will be collected and analyzed by a laboratory to characterize the waste. A technical statement of work will be prepared for the procurement of the waste hauling and disposal subcontractor under Subtask 3.1.11. Field oversight and health and safety monitoring will be conducted during all waste disposal field activities.

3.4 Task 4 Sample Analysis

Section 3.3 and **Table 3-1** summarize the field sampling program and analyses for each sample.

3.4.1 Innovative Methods/Field Screening Sample Analysis

As directed by EPA, this subtask is not applicable.

3.4.2 Analytical Services Provided Via CLP or DESA

As applicable, samples will be analyzed in compliance with the FASTAC Policy. The use of the CLP or DESA and alternatives to standard CLP analysis will be sought with the EPA Regional Sample Control Coordinator (RSCC), prior to any sample collection activities and analyses via the subcontract RAC MSA laboratory. Under the CLP "flexibility clause" modifications are often made to CLP SOWs, enabling achievement of method detection limits (MDLs) that may meet the stated criteria.

The EPA Region 2 policy as shown below will be implemented:

Tier 1: DESA Laboratory (including Environmental Services Assistance Team (ESAT) support)

Tier 2: EPA CLP

Tier 3: Region specific analytical services contracts or use CLP flex clause

Tier 4: Obtaining analytical services using subcontractors via field contracts (such as the RAC 2 MSA subcontractors)

All fixed laboratory analytical needs will to be submitted to the EPA RSCC regardless of the EPA or CLP laboratories' ability to perform. CDM Smith will utilize a MSA laboratory only in the event that the first three tiers are not available.

3.4.3 Non-Routine and Sub-Contract Laboratory Analytical Services

The necessary subcontract laboratories will be procured to provide the required sample analyses including mercury speciation by sequential extraction and dissolved TAL metals plus mercury from the groundwater and surface water sampling program. The laboratory subcontractor will be selected in accordance with EPA-approved criteria and will follow the most current EPA protocols and Region 2 QA requirements. Quality assurance personnel will ensure that the laboratory meets all EPA requirements for laboratory services. Project-specific SOWs govern the analytical work performed by the laboratory subcontractors. The subcontractor laboratory's analytical performance will be monitored during the performance of the subcontract.

The number of samples and analytical parameters are defined on **Table 3-1**. The analytical test methods, detection levels, holding times, parameters, field sample preservation and QC samples will be provided in the QAPP.

3.5 Task 5 – Analytical Support and Data Validation

3.5.1 Collect, Prepare and Ship Samples

Sample preparation and shipment is included under Task 3.

3.5.2 Sample Management

The CDM Smith Analytical Services Coordinator (ASC) will be responsible for all RAS CLP laboratory bookings and coordination with the Sample Management Office (SMO), RSCC, DESA, and/or other EPA sample management offices for sample tracking prior to and after sampling events.

For all RAS activities, The RSCC and SMO will be notified to enable them to track the shipment of samples from the field to the laboratories and to ensure timely laboratory receipt of samples. Sample trip reports will be sent directly to the RSCC and the EPA RPM within seven working days of final sample shipment, with a copy sent to the ASC.

The CLP laboratories will be responsible for providing organic and inorganic analytical data packages to EPA for data validation.

Samples analyzed by the DESA laboratory and/or the subcontract laboratory will be coordinated by the ASC. All analytical data packages from the subcontract laboratory will be sent directly to the firm implementing the investigation for data validation. If requested, these validated data packages will be sent to EPA for QA review purposes. The data will be delivered in a format conducive to database input. CDM Smith will provide the subcontract laboratory with the required EPA Region 2 EDD format.

3.5.3 Data Validation

All subcontract laboratory data will be validated. All chemical data will be validated in accordance with the most recent EPA Region 2 data validation protocols. The validation will determine the usability of the data. The data validation reports will be submitted to EPA after all data have been validated. Data validation will verify that the analytical results were obtained following the protocols specified in the QAPP and are of sufficient quality to be relied upon to prepare the RI report, HHRA report, FS report, and to support a ROD.

3.6 Task 6 – Data Evaluation

This task includes efforts related to the compilation of analytical and field data. All validated data generated during this RI will be entered into CDM Smith's EQuIS™ database to meet EPA Region 2 EDD requirements. Tables, figures, and maps will be generated from the data to support preparation of the RI report, the HHRA report, and the FFS report. The data will be reviewed and carefully evaluated to identify the nature and extent of site-related contamination.

3.6.1 Data Usability Evaluation

The usability of the data, including any uncertainties associated with the data, will be fully evaluated in a data evaluation report (DER). The data validation reports will be reviewed and field sampling techniques, laboratory analytical methods and techniques, and data validation will all be considered in evaluating the usability of the data. The usability of the data will be evaluated using the DQOs as defined in the QAPP. Any rejected data will be discussed in the DER.

3.6.2 Data Reduction, Tabulation and Evaluation

This subtask will include reduction, tabulation, and evaluation of the data collected during the RI field activities. This subtask includes the following activities.

Database Management

Data will be stored in EQuIS™ and can be exported as required to support the analysis and presentation of data using gINT, Microsoft Excel, ArcMAP GIS software, AutoCAD, Surfer, and other applications. Analytical parameters are presented in Table 3-1. Database management

activities, including upload of field sample information, will be performed for the following samples to be collected during the RI field program (includes field quality control samples):

- 521 Sediment samples
 - 473 Analytical samples
 - 24 Field duplicates
 - 24 matrix spike (MS)/matrix spike duplicates (MSD)
- 62 Surface water samples
 - 54 Analytical samples
 - 4 Field duplicates
 - 4 MS/MSDs
- 117 Soil samples
 - 105 Analytical samples
 - 6 Field duplicates
 - 6 MS/MSDs
- 86 Groundwater samples
 - 78 Analytical samples
 - 4 Field duplicates
 - 4 MS/MSDs

All data entry will be checked for QC throughout the multiple phases of the project. Tables that compare analytical results with both state and federal ARARs will be prepared and evaluated.

Well Construction and Soil Boring Logs

Lithologic data from boring and well installation and well construction information will be used with gINT software to generate soil boring logs, well construction diagrams, and cross sections. At the conclusion of the project, lithologic and well construction data will be transferred to EQuIS™. The following data logs will be generated:

- 72 boring logs for the sediment borings
- 21 boring logs for the soil borings
- 24 monitoring well logs
- 15 sediment core logs

GIS and Figures

A GIS (including a basemap) will be created in order to facilitate spatial analysis of the data and to generate figures for reports and presentations. As samples are collected and wells are installed, the locations will be registered in the GIS. Current and select historical analytical results will be added, creating functionality that will be used to support data visualizations appropriate to complement the RI report, FS report, HHRA, and SLERA.

Electronic Data Deliverable

An EDD will be prepared in accordance with EPA Region 2 EDD requirements. The EDD will include the analytical and geologic data generated during the course of the RI as well as the GIS basemap.

3.6.3 Modeling (Optional)

Groundwater modeling is not required by EPA at this time. If during the course of this RI/FS EPA determines performance of this subtask is necessary, the existing data collected under the field investigation will be evaluated and an assessment made of the need for modeling to complete an accurate characterization of the nature, extent, distribution and movement of site contamination. This evaluation is expected to cover the historical distribution and movement of site contamination (forensic modeling) to help identify potential source areas. A technical memorandum will be prepared summarizing the results of this evaluation and recommendations concerning performance of modeling for this RI/FS. Based on its review of this technical memorandum, EPA will determine whether modeling will be conducted for this RI/FS.

3.6.4 Data Evaluation Summary Report

A Data Evaluation Summary Report (DESR) will be prepared to summarize the findings of the RI and identify any gaps in the RI data. EPA will review the Data Evaluation Summary Report and determine if gaps exist in the RI data and whether any supplemental investigation activities are required. Supplemental investigation and data collection activities may include, but are not limited to, the following:

- Activities related to characterization of the underground (culverted) portion of the creek
 - GPR to identify stormwater or other piping connections
 - Robotics to investigate the condition of the underground sections of the creek and stormwater connections
 - Dye studies to verify pipe connections to the creek
- Identification and characterization of upland sources potentially impacting the creek
 - Installation and sampling of well to characterize upland groundwater sources
 - Hydrogeologic studies further characterize groundwater flow and discharge to the creek
 - Soil sampling to characterize upland soil sources

- Sampling of discharges (via pipes or runoff) to characterize discharges from upland sources
- Sampling and analysis
 - Mercury speciation of sediments using electron microprobe technology
 - Biota tissue sampling to support ecological risk assessment

At EPA's discretion, a meeting may be held in lieu of preparation of a formal DESR.

3.7 Task 7 – Assessment of Risk

The objective of the HHRA is to provide an evaluation of potential threats to human health that could occur from exposure to contaminants originating from the site in the absence of any remedial action. The risk assessment also provides the basis for determining whether remedial action is necessary and the justification for performing remedial actions.

3.7.1 Human Health Risk Assessment

A baseline HHRA will be prepared in accordance with the "Risk Assessment Guidance for Superfund, Volume I – Human Health Evaluation Manual" (EPA 2001), using the most current toxicity values. The HHRA will be prepared in accordance with the approach and parameters described in the approved Pathway Analysis submittal.

Draft Baseline Human Health Risk Assessment

Hazard Identification. Identify and describe the COPCs based on their intrinsic toxicological properties.

Dose-Response Assessment. Select the contaminants of concern based on their intrinsic toxicological properties.

Characterization of Site and Potential Receptors. Identify and characterize human populations in the exposure pathways.

Exposure Assessment. The exposure assessment will identify the magnitude of actual or potential human exposures, the frequency and duration of these exposures, and the routes by which receptors are exposed. The exposure assessment will include an evaluation of the likelihood of such exposures occurring and will provide the basis for the development of acceptable exposure levels. In preparing the exposure assessment, reasonable maximum estimates and central tendencies of exposure (when appropriate) will be developed for potential future land use conditions at the Site. The justification and rationale for use of site-specific over default exposure factors will be provided.

Toxicity Assessment. All toxicity values (slope factors and reference doses) for the COPCs and the sources of the toxicity values will be provided, in accordance with EPA's current toxicity hierarchy, as specified in "Human Health Toxicity Values in Superfund Risk Assessments" (EPA 2003). Chemicals without assigned toxicity values in Tiers 1 and 2 will be submitted to EPA for review and determination of the appropriate values.

Risk Characterization. During risk characterization, chemical-specific toxicity information, combined with quantitative and qualitative information from the exposure assessment, will be compared to measured levels of contaminant exposure and the levels predicted through environmental fate and transport modeling. These comparisons will determine whether concentrations of contaminants at or near the site are affecting or could potentially affect human health. Based on these results, other concerns important to the risk characterization, such as a qualitative discussion of chemicals without toxicity data and how concentrations found on site relate to background concentrations will be addressed.

Identification of Limitations/Uncertainties. Critical assumptions and uncertainties (e.g., background concentrations and conditions, modeling inputs, toxicity data, environmental data, etc.) will be identified in the report.

Site Conceptual Model. A conceptual model of the Site will be developed based on the contaminant identification, exposure assessment, toxicity assessment, and risk characterization. The model will initially be submitted as part of Subtask 3.1.13.

Final Baseline Human Health Risk Assessment Report

A Final Baseline HHRA Report will be submitted incorporating all EPA review comments.

3.7.2 Ecological Risk Assessment

A Screening Level Ecological Risk Assessment (SLERA) will be prepared in accordance with the current Superfund ecological risk assessment guidance “Ecological Risk Assessment Guidance for Superfund, Process for Designing and Conducting Ecological Risk Assessments” (EPA 1998). Maximum contaminant concentrations in each medium of concern will be compared to appropriate conservative ecotoxicity screening values and will use conservative exposure estimates. EPA will review and approve the SLERA and determine whether a full Baseline Ecological Assessment is required. At EPA’s direction, a Baseline Ecological Risk Assessment will be performed in accordance with Ecological Risk Assessment Guidance for Superfund (ERAGS).

The SLERA will evaluate and assess the risks to the environment posed by Site contaminants. The activities described below will be performed.

Draft Screening Level Ecological Risk Assessment Report

The draft SLERA report will address the topics described below.

Hazard Identification (sources). Available information on the hazardous substances present at the Site will be reviewed and the major contaminants of concern will be identified.

Dose-Response Assessment. Identify and select contaminants of concern based on their intrinsic toxicological properties.

Characterization of Site and Potential Receptors. Identify and characterize environmental exposure pathways.

Select Chemicals, Indicator Species, and End Points. In preparing the assessment, select representative chemicals, indicator species (species that are especially sensitive to environmental contaminants), and end points on which to concentrate.

Exposure Assessment. The exposure assessment will identify the magnitude of actual or environmental exposures, the frequency and duration of these exposures, and the routes by which receptors are exposed. The exposure assessment will include an evaluation of the likelihood of such exposures occurring and will provide the basis for development of acceptable exposure levels. In preparing the exposure assessment, reasonable maximum estimates of exposure will be developed for both current and potential land use conditions at the Site.

Toxicity Assessment/Ecological Effects Assessment. The toxicity and ecological effects assessment will address the types of adverse environmental effects associated with chemical exposures, the relationships between magnitude of exposure and adverse effects, and the related uncertainties for contaminant toxicity (e.g., weight of evidence for a chemical's carcinogenicity).

Risk Characterization. As part of the risk characterization, compare chemical-specific toxicity information, combined with quantitative and qualitative information from the exposure assessment, to measured levels of contaminant exposure levels and the levels predicted through environmental fate and transport modeling. These comparisons will determine whether concentrations of contaminants at or near the Site are affecting or could potentially affect the environment.

Identification of Limitations/Uncertainties. Identify critical assumptions (e.g., background concentrations and conditions) and uncertainties in the report.

Site Conceptual Model. Develop a conceptual model of the Site based on contaminant identification, exposure assessment, toxicity assessment, and risk characterization.

Final Screening Level Ecological Risk Assessment Report

A final Screening Level Ecological Risk Assessment Report will be prepared incorporating all EPA review comments.

3.8 Task 8 - Treatability Study and Pilot Testing

Remedial technologies that may be suitable to the Site should be identified as early as possible to determine whether there is a need to conduct treatability studies to better estimate performance capabilities and costs. The treatability study would determine the suitability of remedial technologies to Site conditions and problems. The three levels of treatability studies are: laboratory screening, bench-scale testing, and pilot-scale testing. The laboratory screening is used to establish the validity of a technology to treat waste and is normally conducted during the Feasibility Study. Bench-scale testing is used to identify the performance of the technology specific to a type of waste for an operable unit; bench-scale tests are often conducted during the FS. Pilot-scale testing is used to provide quantitative performance, cost, and design information for remediation, and is typically performed during the RI/FS. EPA's "Guide for Conducting Treatability Studies under CERCLA, Final" (1992c) will be followed.

3.8.1 Literature Search

Viable technologies that may be applicable to site-related contaminants and the Site conditions encountered will be researched. A technical memorandum to the EPA RPM will be prepared summarizing the results of the literature research and assessing the need for additional treatability studies. The technical memorandum will also include a plan recommending

performance of a treatability study at one of the above levels and identifying the types and specific goals of the study. The treatability study will determine the suitability of remedial technologies to Site conditions and problems. Based on its review of this technical memorandum, EPA will determine whether a bench test or pilot study will be conducted for this project, and will direct CDM Smith to prepare an addendum to this RI/FS work plan describing the detailed approach for performance of the treatability study, in accordance with the requirements described in Subtask 3.8.2 below.

3.8.2 Treatability Study Work Plan (Optional)

If EPA determines that this task is needed, the treatability study work plan addendum will be prepared and describe in detail the treatment process and how the proposed technology or vendor (if the technology is proprietary) will meet the performance standards for the Site. The treatability study work plan addendum will address how the proposed technology or vendor of the technology will meet all discharge or disposal requirements for any and all treated material, air, water, and expected effluents. In addition, the work plan addendum will explain the proposed final treatment and disposal of all material generated by the proposed treatment system. The treatability study work plan addendum will describe the technology to be tested, test objectives, test equipment or systems, experimental procedures, treatability conditions to be tested, measurements of performance, analytical methods, data management and analysis, health and safety procedures, and residual waste management. The data quality objectives (DQO) for the treatability study will also be documented. If pilot-scale treatability studies are to be done, the treatability study work plan addendum will describe pilot plant installation and startup, pilot plant operation and maintenance procedures, and operating conditions to be tested. If testing is to be performed off-site, the addendum will address permitting requirements. The addendum will include a proposed schedule for performing the treatability study, with specific dates for each task and subtask (including anticipated EPA review periods). Key milestones for which completion dates will be specified include procurement of subcontractors, sample collection, sample analysis and preparation of the treatability study report.

3.8.3 Conduct Treatability Studies (Optional)

If EPA determines that this task is needed a treatability study will be conducted in accordance with the approved treatability study addendums to the RI/FS work plan, QAPP, and HASP, to determine whether the remediation technology (or vendor of the technology) can achieve the required performance standards. The activities described below are required as part of the performance of the treatability study and pilot testing.

Procure Test Facility and Equipment. Procure the subcontractors, test facility and equipment necessary to perform the tests.

Test and Operate Equipment. Test the equipment to ensure proper operation, and operate or oversee operation of the equipment during the testing.

Retrieve Samples for Testing. Collect samples for testing as specified in the treatability study work plan addendum.

Perform Laboratory Analysis. Establish a field laboratory to facilitate fast turnaround analysis of test samples, or if necessary, will procure subcontractor laboratory services to analyze the test samples and evaluate test results.

Characterize and dispose of residual wastes. Ensure that residual wastes are characterized and disposed of in accordance with the work plan addendum and QAPP.

3.8.4 Treatability Study Report (Optional)

If EPA determines that this task is needed, a treatability study evaluation report will be prepared that describes the performance of the technology. The study results will clearly describe the performance of the technology or vendor in comparison with the performance standards established for the site. The report will also evaluate the treatment technology's effectiveness, implementability, cost, and final results as compared with the predicted results. The report will evaluate full-scale application of the technology, including a sensitivity analysis identifying the key parameters affecting full-scale operation.

3.9 Task 9 - Remedial Investigation Report

An RI report will be developed and submitted that accurately establishes Site characteristics including the identification of contaminated media, definition of the extent of contamination in Site media, and delineation of the physical boundaries of contamination. Sampling data will be used to identify key contaminants and determine the movement and extent of contamination in the environment. Key contaminants will be identified in the report and will be selected based on toxicity, persistence, and mobility in the environment.

3.9.1 Draft Remedial Investigation Report

A draft RI report will be prepared in accordance with the format described in EPA guidance documents such as the “Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA” (EPA 1988). A draft outline of the report, adapted from the 1988 guidance, is shown in **Table 3-2**. This outline should be considered draft and subject to revision based on the data obtained. EPA’s SOW for this work assignment provides a detailed description of the types of information, maps, and figures to be included in the RI report. Upon completion, the draft RI report will be submitted to EPA, and other city, state, and federal agencies, as directed by EPA, for formal review and comment.

3.9.2 Final Remedial Investigation Report

Upon receipt of all EPA and other federal and state written comments, responses to significant comments will be developed. EPA will review and approve the responses and the report will be finalized in accordance with the EPA approved responses.

3.10 Task 10 - Remedial Alternatives Screening

This task covers the development of appropriate remedial alternatives that will undergo full evaluation. The alternatives will encompass a range, including innovative treatment technologies, consistent with the regulations outlined in the National Contingency Plan (NCP), 40 CFR Part 300, the “Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA” (EPA 1998), and other applicable Office of Solid Waste and Emergency Response (OSWER)

directives, policies and guidance (including “Considerations in Ground Water Remediation at Superfund Sites,” (EPA 1989), and “Considerations in Ground Water Remediation at Superfund Sites - Update,” (EPA 1992).

Alternatives will be investigated that will remediate or control contaminated media related to the Site, as defined in the RI, to provide adequate protection of human health and the environment. The potential alternatives will encompass, as appropriate, a range of alternatives in which treatment is used to reduce the toxicity, mobility, or volume of wastes but vary in the degree to which long-term management of residuals or untreated waste is required. Innovative treatment technologies will be included. One or more alternatives will be included that involve containment with little or no treatment, as well as a no-action alternative.

The alternatives will be screened qualitatively against three criteria: effectiveness, implementability, and relative cost. A brief description of the application of these criteria is presented below.

- **Effectiveness** - The evaluation focuses on the potential effectiveness of technologies in meeting the remedial action goals; the potential impacts to human health and the environment during construction and implementation; and how proven and reliable the process is with respect to the contaminants and conditions at the site.
- **Implementability** - This evaluation encompasses both the technical and administrative feasibility of the technology. It includes an evaluation of treatment requirements, waste management, and relative ease or difficulty in achieving the operation and maintenance requirements. Technologies that are clearly unworkable at the site are eliminated.
- **Relative Cost** - Both capital cost and operation and maintenance cost are considered. The cost analysis is based upon engineering judgment, and each technology is evaluated as to whether costs are high, moderate, or low relative to other options within the same category.

The screening evaluation will generally focus on the effectiveness criterion, with less emphasis on the implementability and relative cost criteria. Technologies surviving the screening process are those that are expected to achieve the remedial action objectives for the Site, either alone or in combination with others.

3.10.1 Technical Memorandum

A technical memorandum will be prepared and a meeting with EPA will be attended that describes the remedial technology screening and that includes the information summarized below.

- **Establish Remedial Action Objectives.** Based on existing information, site-specific remedial action objectives will be identified that should be developed to protect human health and the environment. The objectives will specify the contaminant(s) and media of concern, the exposure route(s) and receptor(s), and an acceptable contaminant level or range of levels for each exposure route (i.e., preliminary remediation goals).

- **Establish General Response Actions.** General response actions will be developed for each medium of interest by defining contaminant, treatment, excavation, pumping, or other actions, singly or in combination to satisfy remedial action objectives. The response actions will take into account requirements for protectiveness as identified in the remedial action objectives and the chemical and physical characteristics of the site.
- **Identify and Screen Applicable Remedial Technologies.** Technologies will be identified and screened based on the general response actions. Hazardous waste treatment technologies will be identified and screened to ensure that only those technologies applicable to the contaminants present, their physical matrix, and other Site characteristics will be considered. This screening will be based primarily on a technology's ability to address the contaminants at the site effectively, but will also take into account that technology's implementability and cost. Representative process options will be selected, as appropriate, to carry forward into alternative development and will identify the need for treatability testing for those technologies that are probable candidates for consideration during the detailed analysis.
- **Develop Remedial Alternatives in accordance with the NCP.** Subsequent to the screening of the applicable remedial technologies and process options, remedial action alternatives will be developed by combining the retained remedial technologies and process options. Remedial alternatives are developed from either stand-alone process options or combinations of the retained process options.
- **Screen Remedial Alternatives for Effectiveness, Implementability, and Cost.** Alternatives will be screened to identify the potential technologies or process options that will be combined into media-specific or site-wide alternatives. The developed alternatives will be defined with respect to size and configuration of the representative process options, time for remediation, rates of treatment, spatial requirements, distance for disposal, required permits, imposed limitations, and other factors necessary to evaluate the alternatives. If many distinct viable options are available and developed, the alternatives undergoing detailed analysis will be screened to provide the most promising process options.

The technical evaluations completed as part of this task will also be summarized and presented to EPA in a technical meeting following submission of the technical memorandum.

3.10.2 Final Technical Memorandum

As directed by EPA, this subtask is not applicable. EPA's review comments on the technical memorandum will be incorporated into the draft FS report as described in Section 3.12.1.

3.11 Task 11 - Remedial Alternatives Evaluation

Detailed descriptions of the individual remedial alternatives will be developed and the alternatives will be assessed against each of the nine current evaluation criteria and the comparative analysis of remedial alternatives with respect to the evaluation criteria. The analysis will be consistent with the National Contingency Plan, 40 CFR Part 300 and will consider the "Guidance for Conducting Remedial Investigation and Feasibility Studies under CERCLA" (EPA 1988) and other pertinent guidance.

The nine criteria are: (1) overall protection of human health and the environment; (2) compliance with applicable or relevant and appropriate requirements (ARARs); (3) long-term effectiveness; (4) reduction of toxicity, mobility, or volume; (5) short-term effectiveness; (6) implementability; (7) cost; (8) state Acceptance; and (9) community acceptance. These evaluation criteria are detailed in **Table 3-3**.

Each remedial alternative will be subject to a detailed analysis according to the first seven of the nine above evaluation criteria (State and community acceptance will be addressed later). A comparative analysis of all alternatives will then be performed to evaluate the relative benefits and drawbacks of each according to the same seven criteria.

3.11.1 Technical Memorandum

A Technical Memorandum will be prepared to discuss the following topics: (1) a technical description of each alternative will outline the waste management strategy involved and identify the key ARARs associated with each alternative; and (2) a summary of each alternative compared to the evaluation criteria. Tables will be provided that summarize the evaluations. At EPA's discretion, a meeting may be held in lieu of a technical memorandum to discuss the remedial alternatives and their evaluation against the evaluation criteria.

3.11.2 Final Technical Memorandum

As directed by EPA, this subtask is not applicable.

3.12 Task 12 - Feasibility Study Report

A feasibility study report will be developed consisting of a detailed analysis of alternatives and a cost-effectiveness analysis, in accordance with the NCP (40 CFR Part 300) as well as the most recent guidance.

3.12.1 Draft Feasibility Study Report

A draft feasibility study report will be submitted to EPA that includes the following detailed information. The draft FS report will address comments received from EPA and other reviewers on the Technical Memorandum submitted under Task 10 and the meeting under Task 11.

- Summary of the RI – Summarize key elements of the RI including the nature and extent of contamination in all site media of concern, the fate and transport factors that affect the identified contamination, and the results of the site risk assessments.
- Establish Remedial Action Objectives.
- Identify General Response Actions.
- Screen Applicable Remedial Technologies - EPA may, if applicable, request an analytical flow model to support groundwater flow and plume capture model of the hydrogeologic system at the Site and surrounding area.
- Develop Remedial Alternatives in accordance with the NCP - Assemble technologies into remedial alternatives to address the identified contamination at the Site.

- Screen Remedial Alternatives for effectiveness, implementability, and cost.
- Develop Detailed Alternative Descriptions - Develop detailed technical descriptions of each alternative that outlines the waste management strategy involved and identifies the key ARARs associated with each alternative.
- Screen Against Evaluation Criteria - Present discussions that describe the performance of each alternative with respect to the evaluation criteria described in Section 3.11. The results of the analysis will be summarized in a table.
- Comparative Evaluation of Alternatives - Compare and contrast the alternatives to one another, with respect to each of the evaluation criteria.

The technical feasibility considerations will include the careful study of any problems that may prevent a remedial alternative from mitigating site problems. Therefore, the Site characteristics from the RI will be kept in mind as the technical feasibility of the alternative is studied. Specific items to be addressed will be reliability (operation over time), safety, operation and maintenance, ease with which the alternative can be implemented, and time needed for implementation.

Evaluation criteria are shown on Table 3-3. The executive summary will be a brief overview of the FS and the analysis underlying the remedial actions that were evaluated.

The draft FS report will be reviewed by a Technical Review Committee (TRC). TRC comments will be addressed prior to submittal to EPA, and other city, state, and federal agencies, as directed by EPA, for formal review and comment.

3.12.2 Final Feasibility Study Report

Upon receipt of all EPA and other federal and state written comments, a response to comments letter for major comments will be prepared. After EPA approves the responses, the FS report will be finalized for submittal to EPA.

3.13 Task 13 Post RI/FS Support

Technical support will be provided if required for the preparation of the Record of Decision (ROD), excluding community involvement activities already addressed under Task 2. Support activities will include the following items.

- Attendance at public meetings, briefings, and technical meetings to provide site updates
- Review of presentation materials
- Technical support for presentation of draft and final Responsiveness Summary, Proposed Plan, and ROD
- Preparation and review of a draft and final Feasibility Study addendum (if required), based on the final ROD adopted for this site, covering issues arising after finalization of the basic RI/FS documents

3.14 Task 14 - Closeout

Project closeout includes work efforts related to the project completion and closeout phase. Project records will be transferred to EPA.

3.14.1 Document Indexing

CDM Smith will organize the work assignment files in its possession in accordance with the currently approved file index structure.

3.14.2 Document Retention/Conversion

All pertinent paper files will be converted into an appropriate long-term storage electronic format (compact disks or digital video discs [DVDs]). EPA will define the specific long-term storage format prior to closeout of this work assignment.

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Section 4

References

ASTM. 2016. Standard Guide for Greener Cleanups, E2893. April 1, 2016.

(www.astm.org/standards/E2893.htm).

CDM Federal Programs Corporation (CDM Smith). 2016. Technical Memorandum – Summary of Existing Information and Data Gap Evaluation. May 24.

_____. 2015. Draft Pierson's Creek Site Work Plan. November 9, 2015.

_____. 2012. Region 2 RAC2 Quality Management Plan – Revision 2. October 11.

United States Environmental Protection Agency (EPA). 2015a. Comprehensive Electronic Data Deliverable Specification Manual 3.0. Region 2.

_____. 2015b. Electronic Data Deliverables Valid Values Reference Manual. June.

_____. 2015c. Electronic Data Deliverable Basic Manual for Historic Electronic Data Version 4.0. June.

_____. 2012. Basic Manual for Historic Electronic Data, Version 3.0. August.

_____. 2006. EPA Requirements for Quality Assurance Project Plans EPA QA/R-5. EPA/240/B-01/003, March 2001; reissued May 2006.

_____. 2005a. Uniform Federal Policy for Quality Assurance Project Plans. EPA-505-B-04-900A. March.

_____. 2005b. Superfund Community Involvement Handbook. EPA 540-K-05-003. April.

_____. 2001. Risk Assessment Guidance for Superfund: Volume I – Human Health Evaluation Manual and Part D. December.

_____. 1998. Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA. OSWER Directive 9355.3-01. October.

_____. 1998b. Guidelines for Ecological Risk Assessment. Office of Research and Development. EPA/630/R-95/002F. April.

_____. 1992. Considerations in Ground Water Remediation at Superfund Sites – Update. 9283.1-06. May.

_____. No date. http://www.epa.gov/region02/superfund/green_remediation/policy.html.

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Tables

Table 3-1
Field Sampling Program Summary
Pierson's Creek Site
Newark, New Jersey

Task	Section	Locations	Laboratory TAT	Sampling/Measurement Activities					
				Frequency / Intervals	Analytical Parameters			Field Parameters	Total Samples ¹
					DESA or CLP	DESA	Subcontract Lab		
Sediment Sampling	Background	3 cores	42 days validated	0 to 0.5, 0.5 to 1.5, 1.5 to 3, 3 to 5 feet, top 6 inches of native sediment	TCL organics, CN, filtered and unfiltered TAL metals and Hg	grain size, TOC	Total, elemental and methylmercury, % total solids, mercury by sequential extraction (0-0.5 feet only)	none	15
	Upper Creek Section	18 cores							90
	Middle Creek Section	31 cores							155
	Lower Creek Section	20 cores							100
	Lower Creek Section/Culverted Section	8 samples		Grab Sample					8
	Port Newark Channel Background	3 cores		0 to 0.5, 0.5 to 1.5, 1.5 to 3, 3 to 5, 5 to 7, 7 to 10 feet, top 6 inches of native sediment					21
	Port Newark Channel	12 cores							84
Waste Characterization Sediment Sampling	One Sample from each section	5 samples	42 days validated	composite 0-6 inches bgs	none	none	Leachability (modified SPLP for 8 RCRA metals); TCLP for 8 RCRA metals, Reactivity (hydrogen sulfide gas generates at a pH of 2)	none	5
Surface Water Sampling (Dry Weather)	Upper Creek Section	4 locations	42 days validated	48 hours with no precipitation	TCL organics, CN, filtered and unfiltered TAL metals and Hg	TDS, TSS, POC, DOC, chloride, sulfate, phosphate, nitrate, bicarbonate, calcium, magnesium, sodium, potassium, ammonia and alkalinity	Total and filtered trace mercury and methylmercury	pH, Temp, Cond, DO, Turbidity, UVA at 254 nm	4
	Middle Creek Section	7 locations							7
	Lower Creek Section	7 locations							7
	Lower Creek Section/Culverted Section	8 locations							8
	Port Newark Channel	1 location							1
Surface Water Sampling (Wet Weather)	Upper Creek Section	4 locations	42 days validated	Minimum 0.5 inch storm following 48 hours of no precipitation	TCL organics, CN, filtered and unfiltered TAL metals and Hg	TDS, TSS, POC, DOC, chloride, sulfate, phosphate, nitrate, bicarbonate, calcium, magnesium, sodium, potassium, ammonia and alkalinity	Total and filtered trace mercury and methylmercury	pH, Temp, Cond, DO, Turbidity, UVA at 254 nm	4
	Middle Creek Section	7 locations							7
	Lower Creek Section	7 locations							7
	Lower Creek Section/Culverted Section	8 locations							8
	Port Newark Channel	1 location							1

Table 3-1
Field Sampling Program Summary
Pierson's Creek Site
Newark, New Jersey

Task	Section	Locations	Laboratory TAT	Sampling/Measurement Activities					
				Frequency / Intervals	Analytical Parameters			Field Parameters	Total Samples ¹
					DESA or CLP	DESA	Subcontract Lab		
Soil Sampling	Background	3 borings	42 days validated	0 to 0.5, 0.5 to 1.5, 1.5 to 3, 3 to 5 feet, top 6 inches of native soil	TCL organics, TAL metals, CN, Hg	grain size, TOC	Total, elemental and methylmercury, % total solids	none	15
	Upper Creek Section	3 borings							15
	Middle Creek Section	15 borings							75
Groundwater sampling (Round 1)	Upper Creek Section	11 existing, 8 new	42 days validated	per well	TCL organics, CN, filtered and unfiltered TAL metals and Hg	TDS, TSS, TOC, DOC, chloride, sulfate, phosphate, nitrate, bicarbonate, calcium, magnesium, sodium, potassium, and alkalinity	Total and filtered trace mercury and methylmercury,	pH, Temp, Cond, DO, Turbidity, UVA at 254 nm	19
	Middle Creek Section	4 existing, 12 new							16
	Lower Creek Section	4 new							4
Groundwater sampling (Round 2)	Upper Creek Section	11 existing, 8 new	42 days validated	per well	TCL organics, CN, filtered and unfiltered TAL metals and Hg	TDS, TSS, POC, DOC, chloride, sulfate, phosphate, nitrate, bicarbonate, calcium, magnesium, sodium, potassium, and alkalinity	Total and filtered trace mercury and methylmercury,	pH, Temp, Cond, DO, Turbidity, UVA at 254 nm	19
	Middle Creek Section	4 existing, 12 new							16
	Lower Creek Section	4 new							4

Notes: 1: Totals do not include QC samples

Abbreviations:

CLP - Contract Laboratory Program	RCRA - Resource Conservation and Recovery act
CN - Cyanide	SPLP - Synthetic Precipitation Leaching Procedure (SPLP) (U.S. EPA Method 1312)
Cond - conductivity	TAL - Target analyte list
DESA - Division of Environmental Science and Assessment	TDS - Total Dissolved Solids
DO - dissolved oxygen	Temp - Temperature
DOC - dissolved organic carbon	TSS - Total Suspended Solids
Hg - mercury	TCLP - Toxicity Characteristics Leaching Procedure
POC - Particulate Organic Carbon	

Table 3-2
Proposed RI Report Format
Pierson's Creek Site
Newark, New Jersey

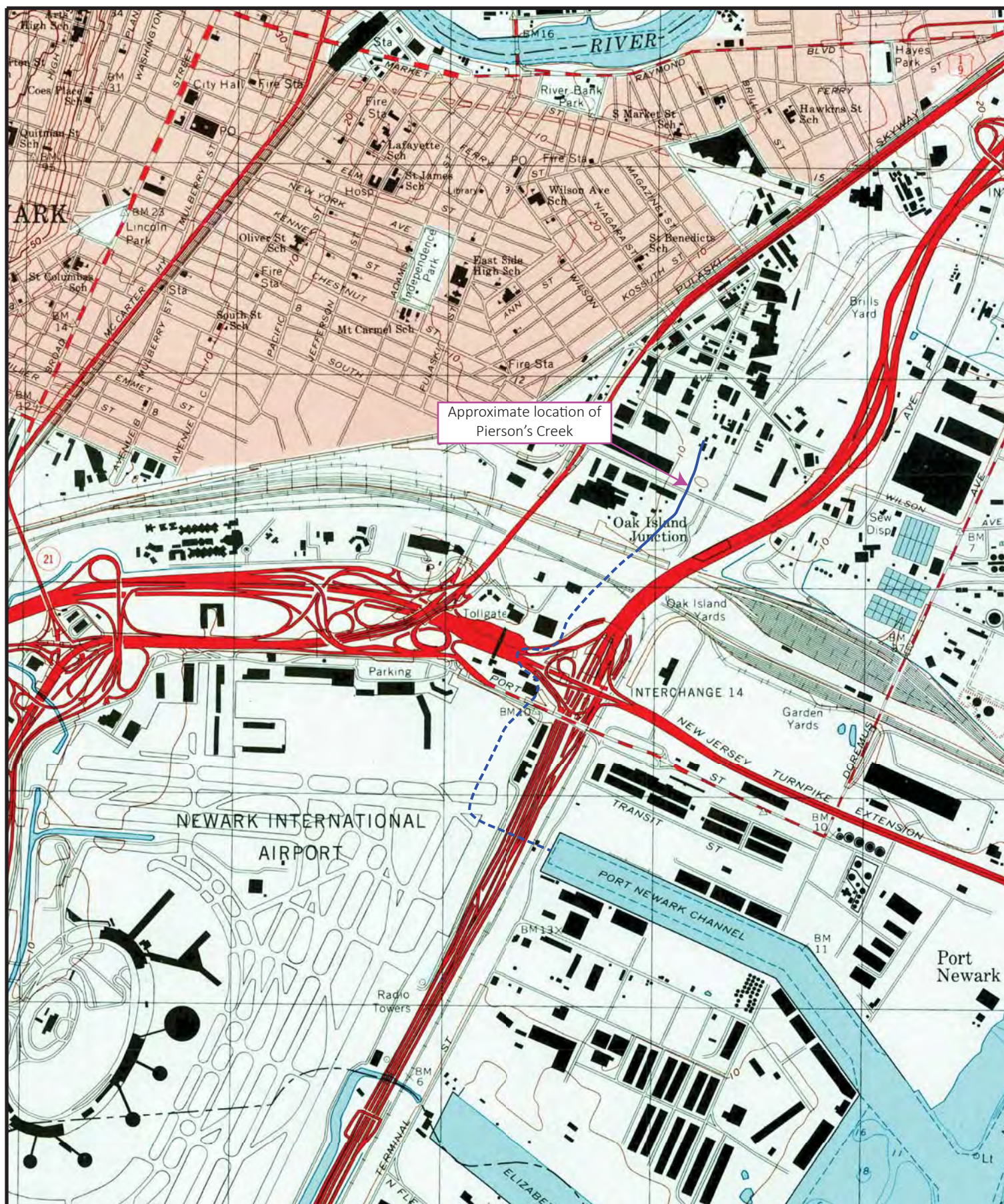
1.0	Introduction
1.1	Purpose of Report
1.2	Site Background
1.2.1	Site Description
1.2.2	Site History
1.2.3	Previous Investigations
1.3	Report Organization
2.0	Study Area Investigation
2.1	Surface Features
2.2	Soil Investigations
2.3	Hydrogeological Investigations
2.4	Ecological Characterization
3.0	Physical Characteristics of Site
3.1	Topography
3.2	Meteorology
3.3	Soils
3.4	Geology
3.5	Hydrogeology
3.6	Supply Wells
3.7	Demographics and Land Use
4.0	Nature and Extent of Contamination
4.1	Selection of Site-Related Contaminants
4.2	Screening Criteria
4.3	Sediment Results
4.2	Surface Water Results
4.2	Soils Results
4.4	Groundwater Results
4.5	Evaluation of Sediment, Surface Water, Soil and Groundwater Results
5.0	Contaminant Fate and Transport
5.1	Routes of Migration
5.2	Contaminant Persistence
5.3	Contaminant Migration
6.0	Baseline Human Health Risk Assessment (submitted separately from RI report)
	Screening Level Ecological Risk Assessment (submitted separately from RI report)
7.0	Conclusions and Recommendations
7.1	Conclusions by Media
7.2	Recommendations for Future Work
	Appendices:
	Boring Logs
	Well Construction Logs
	Hydrogeologic Data
	Analytical Data
	Data Usability Evaluation

Table 3-3
Detailed Evaluation Criteria for Remedial Alternatives
Pierson's Creek Site
Newark, New Jersey

<ul style="list-style-type: none"> ▪ OVERALL PROTECTION OF HUMAN HEALTH AND ENVIRONMENT
<ul style="list-style-type: none"> ▪ COMPLIANCE WITH ARARS <ul style="list-style-type: none"> - Compliance with chemical-specific ARARS - Compliance with action-specific ARARS - Compliance with location-specific ARARS - Compliance with appropriate criteria, advisories and guidance
<ul style="list-style-type: none"> ▪ LONG-TERM EFFECTIVENESS <ul style="list-style-type: none"> - Magnitude of risk remaining at the site after the response objectives have been met - Adequacy of controls - Reliability of controls
<ul style="list-style-type: none"> ▪ REDUCTION OF TOXICITY, MOBILITY OR VOLUME THROUGH TREATMENT <ul style="list-style-type: none"> - Treatment process and remedy - Amount of hazardous material destroyed or treated - Reduction in toxicity, mobility or volume of the contaminants - Irreversibility of the treatment - Type and quantity of treatment residuals
<ul style="list-style-type: none"> ▪ SHORT-TERM EFFECTIVENESS <ul style="list-style-type: none"> - Protection of community during remedial action - Protection of workers during remedial actions - Time until remedial response objectives are achieved - Environmental impacts
<ul style="list-style-type: none"> ▪ IMPLEMENTABILITY <ul style="list-style-type: none"> - Ability to construct technology - Reliability of technology - Ease of undertaking additional remedial action, if necessary - Monitoring considerations - Coordination with other agencies - Availability of treatment, storage capacity, and disposal services - Availability of necessary equipment and specialists - Availability of prospective technologies
<ul style="list-style-type: none"> ▪ COST <ul style="list-style-type: none"> - Capital costs - Annual operating and maintenance costs - Present worth - Sensitivity Analysis
<ul style="list-style-type: none"> ▪ COMMONWEALTH ACCEPTANCE
<ul style="list-style-type: none"> ▪ COMMUNITY ACCEPTANCE



Figures



Source: USGS 7.5 Minute Quadrangle Map, Elizabeth, New Jersey

— Aboveground portion of Pierson's Creek
 - - - Underground portion of Pierson's Creek

CDM
 Smith

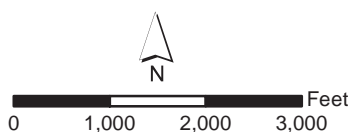


Figure 1-1
 Site Location
 Pierson's Creek
 Newark, New Jersey

**Figure 2-1
Pierson's Creek Site RI/FS
Project Organizational Chart**

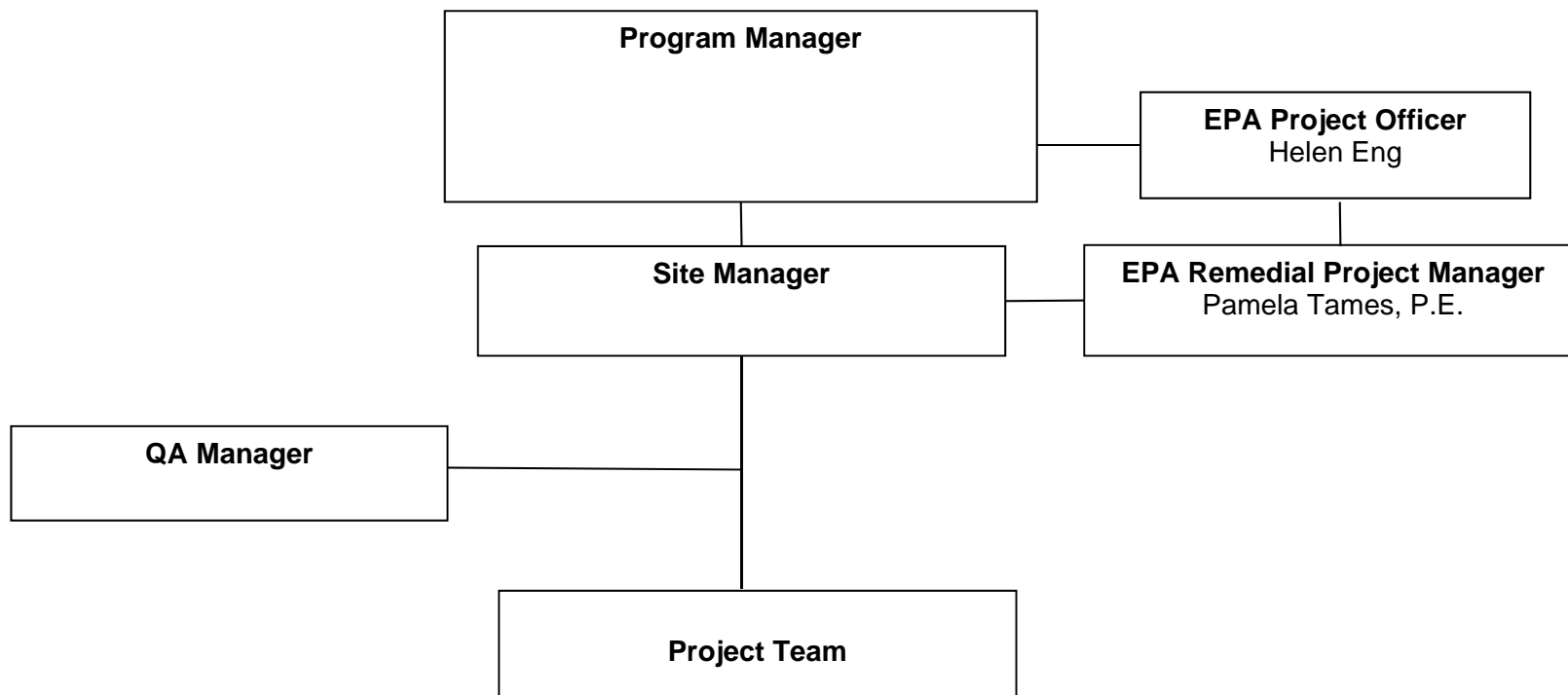
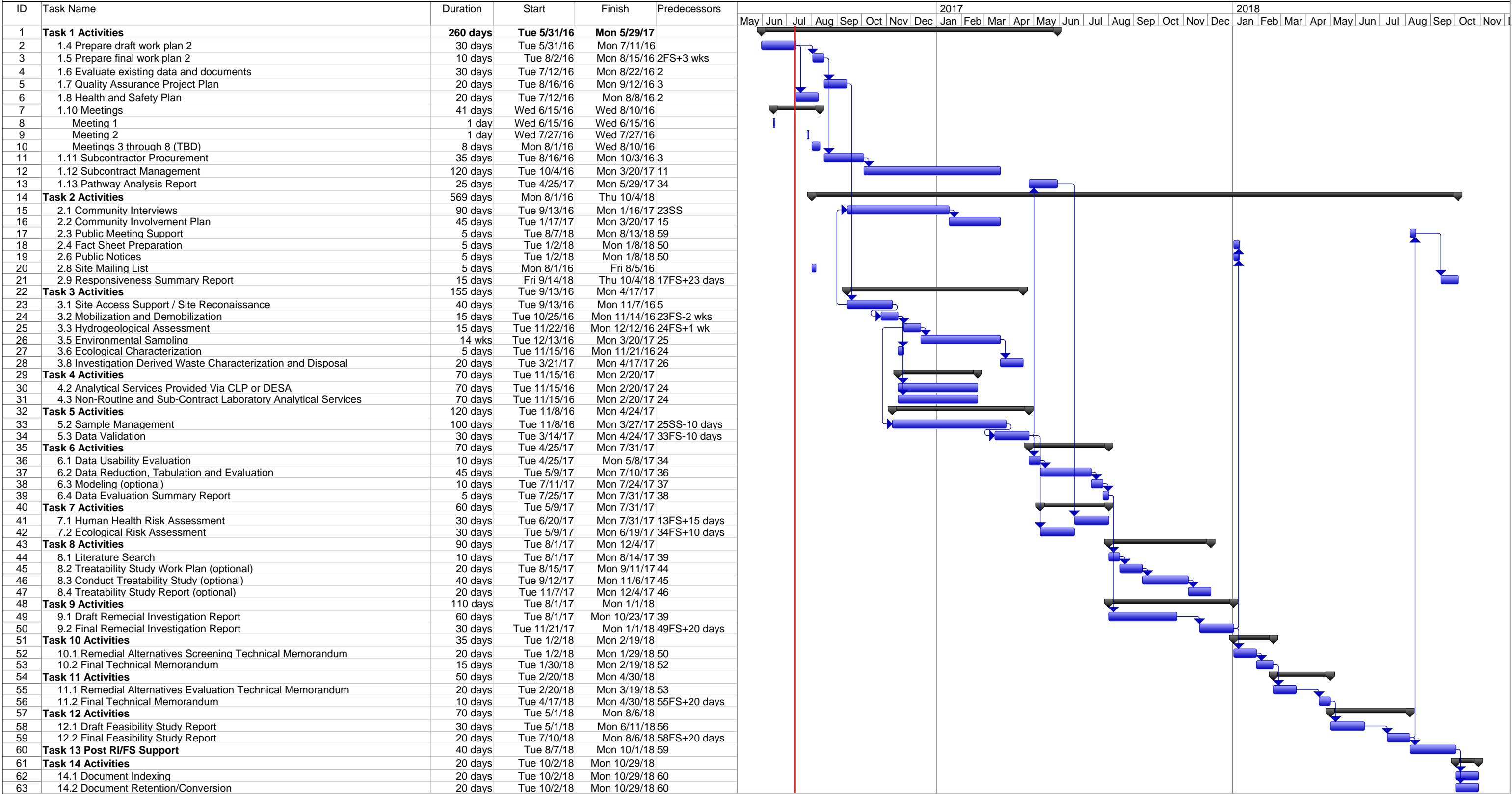


Figure 2-2
Pierson's Creek Site
Project Schedule Schedule



Highlighted cells indicate EPA Task
Date: Mon 7/11/16
Pierson's Creek_ Draft Task 1 Schedu



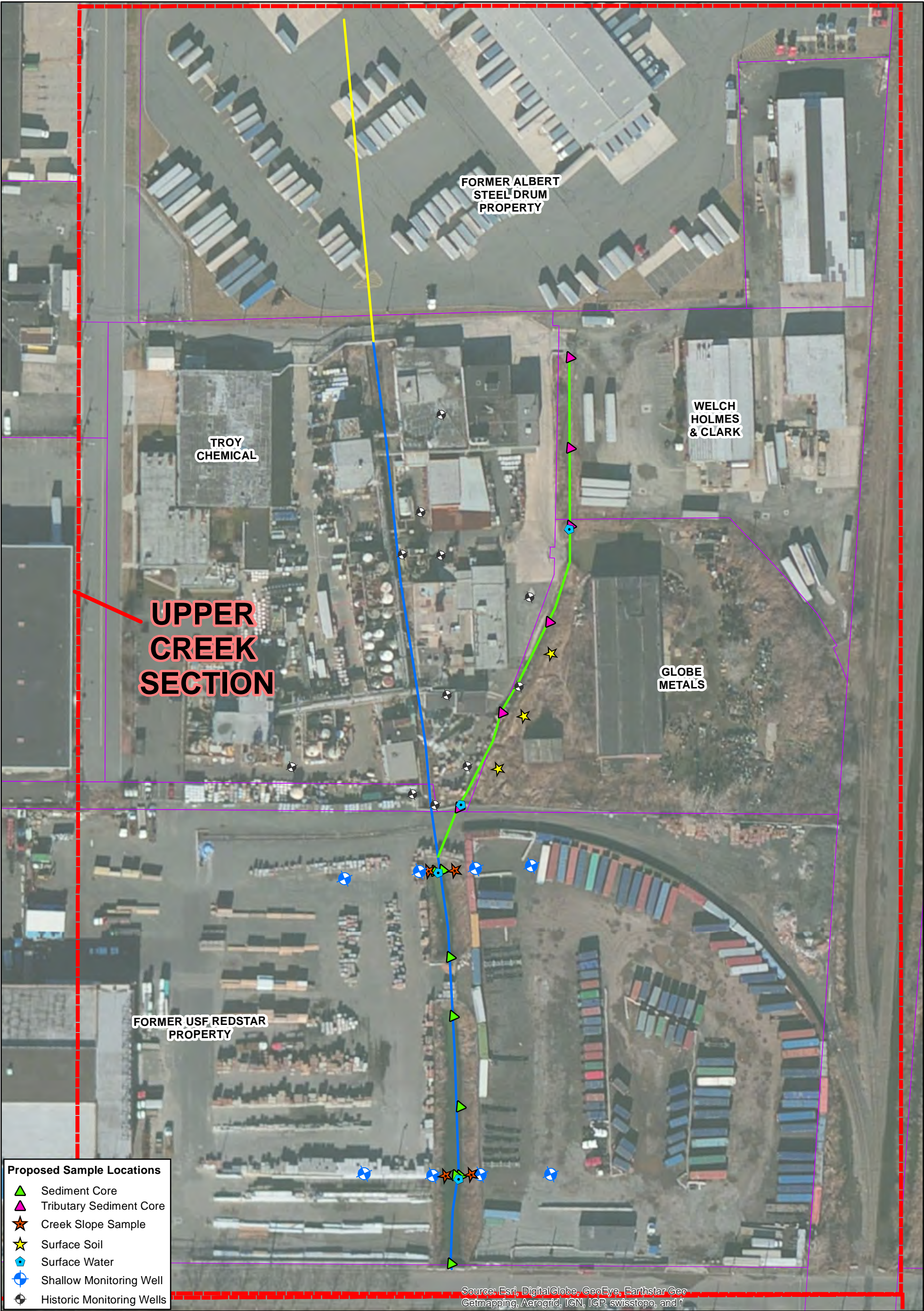
Pierson's Creek Orientation

- Current Pierson's Creek Channel (open channel)
- Current Pierson's Creek Channel (culverted)
- Feeder Creeks
- Former Portion of Pierson's Creek
- Tax Parcels
- Creek Sections

0 600 1,200 Feet

1 in = 600 feet

Figure 3-1
Pierson's Creek Sections
Pierson's Creek Superfund Site
Newark, NJ



- Pierson's Creek Orientation**
- Current Pierson's Creek Channel (open channel)
 - Current Pierson's Creek Channel (culverted)
 - Feeder Creeks
 - Former Portion of Pierson's Creek
 - Tax Parcels
 - Creek Sections

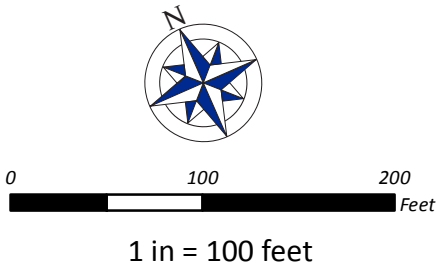
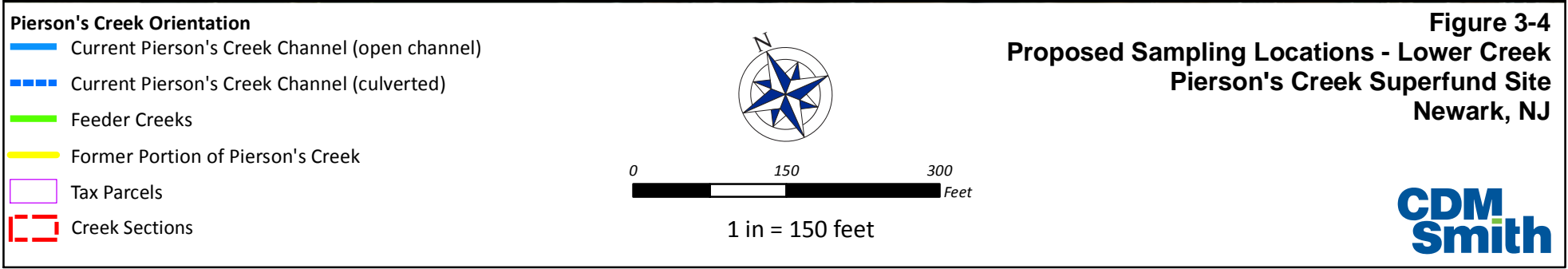
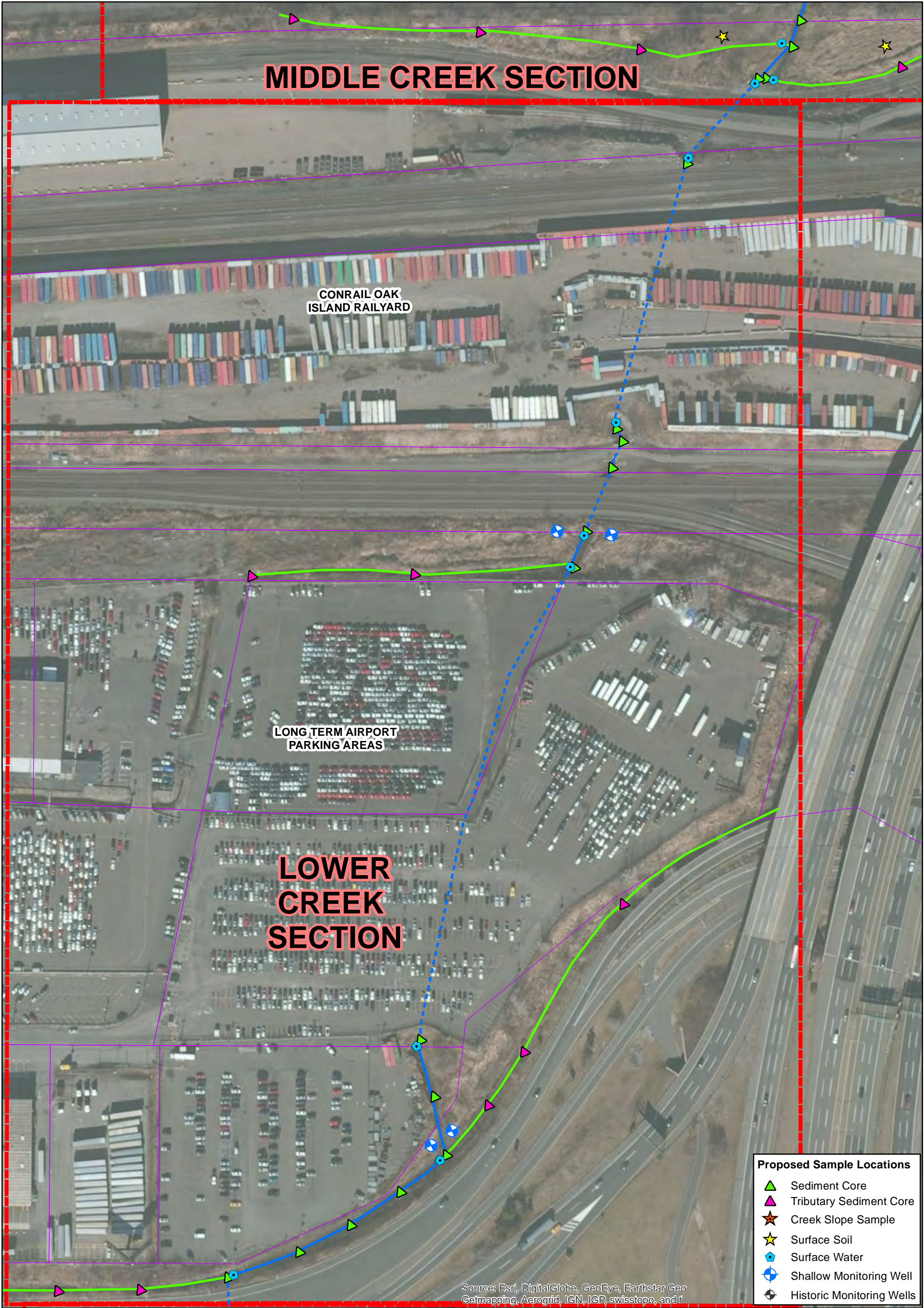


Figure 3-2
Proposed Sampling Locations - Upper Creek
Pierson's Creek Superfund Site
Newark, NJ



Figure 3-3
Proposed Sampling Locations - Middle Creek
Pierson's Creek Superfund Site
Newark, NJ





- Pierson's Creek Orientation**
- Current Pierson's Creek Channel (open channel)
 - - - Current Pierson's Creek Channel (culverted)
 - Feeder Creeks
 - Former Portion of Pierson's Creek
 - Tax Parcels
 - ▭ Creek Sections

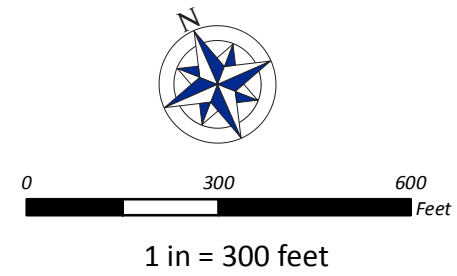


Figure 3-5
Proposed Sampling Locations - Port Newark Channel
Pierson's Creek Superfund Site
Newark, NJ

